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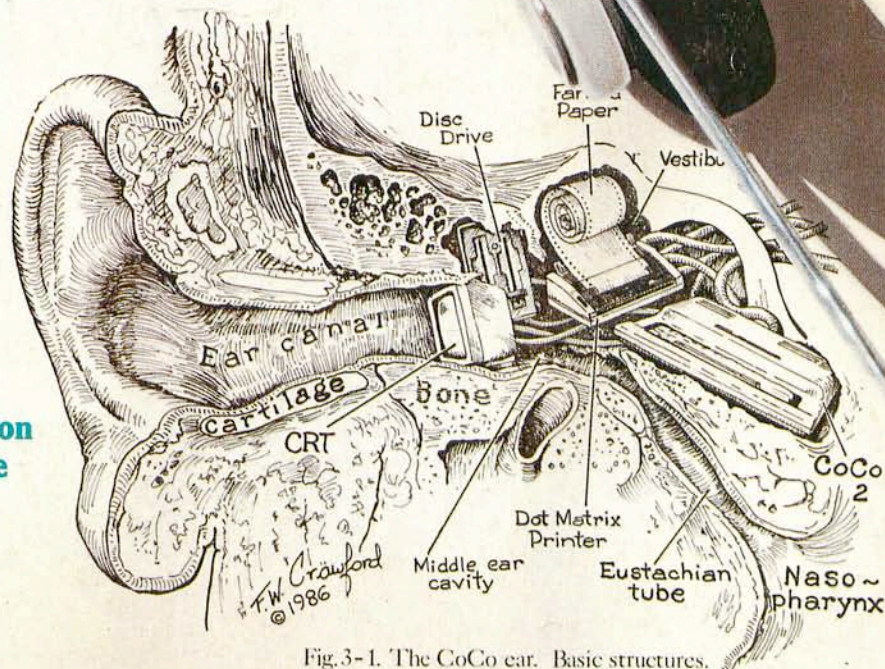


Fig. 3-1. The CoCo ear. Basic structures.

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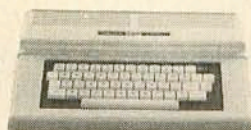
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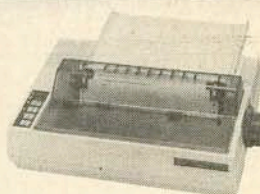
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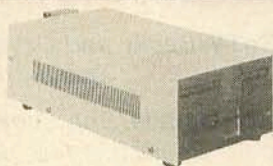
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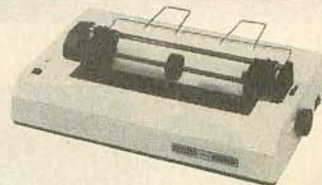
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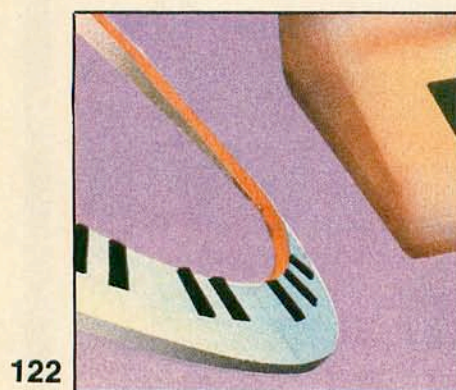
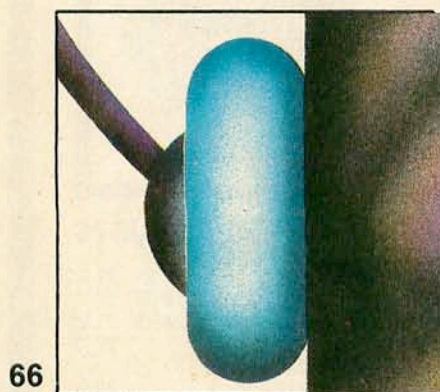
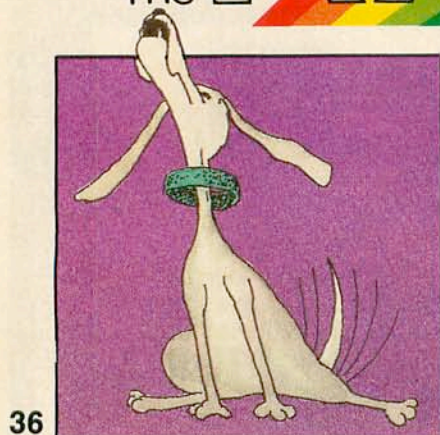


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# Under The RAINBOW



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by Fred Crawford

The small cassette tape symbols beside features and regular columns indicate that those articles are on this month's RAINBOW ON TAPE, ready to CLOAD and RUN. For full details, check our RAINBOW ON TAPE ad on Page 180.

**NEXT MONTH:** Can it be true? THE RAINBOW turns 5! Our Fifth Anniversary edition will heat up your summer with a festival of features to make the CoCo sparkle, columns that sizzle with hot new ideas and scintillating reviews to spark your interest.

Look for some exhilarating birthday highlights and an extra-special anniversary surprise. We'll also include a complete index to the past year of THE RAINBOW, plus our usual array of games, utilities and graphics.

Don't miss the Fifth Anniversary RAINBOW — come celebrate with us!



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June 1986

Vol. V No. 11

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# LETTERS TO THE RAINBOW

## Questions? ... We have the Answers!

Editor:

I am retired and have been paying into an IRA account. How much is this account worth now? I am going to sell the house that I bought in 1974. How much is it worth today? I need to pour concrete. How much will it take?

All three questions were answered by the April 1986 RAINBOW. Thanks CoCo and RAINBOW.

W.E. Pendergrass  
Danville, KY

**Editor's Note:** Glad you liked our Home Help Issue. Programs referred to can be found on pages 70, 79 and 162.

### BACK TALK

Editor:

This is in response to M.S. McPherson's letter in the April 1986 issue [Page 9] about the program by the Delbourgos that creates the image of the earth's rotation (August 1985, Page 73). The spinning of the earth can be easily adjusted by a slight change of Line 180 of Listing 2 (*Pageturn*). By changing the number 40 in the section of the line that says, "FORT=1TD40", you can speed up or slow down the rotation. The smaller the number, the faster the rotation. My preference is "FORT=1TD190". I hope this helps slow down the spinning of Mr. McPherson's world.

Barb Karr  
Risingsun, OH

### \$C0 can be Valid

Editor:

In "A Disk Tinker's Device" in the March 1986 issue (Page 88) Martin Goodman questions the validity of \$C0 in the GAT. There are two situations where \$C0 is valid.

The first situation occurs when a BASIC program opens two sequential output files for the first time. File number one's first

GAT byte is initially \$FF. This makes sense because file number one's size is initially undefined. A problem arises upon opening sequential output file number two. The routine that scans the GAT for free granules (\$FF's) might accidentally assign to file number two the same granule that was assigned to file number one. To avoid this, file number one's GAT byte is changed to \$C0. Its granule is no longer marked free. If the file is closed before any data has been written to it, the first GAT byte will be \$C1 because EOF information is written to the file.

Direct access files are similar except that \$C0 is initially assigned as the file's first GAT byte. Unlike sequential files, when a direct access file is closed the GAT byte can still be a \$C0. Why? A record doesn't have to occupy an entire sector, its size is user definable and a file can have zero records in it, thus occupying no space. A \$C0 GAT byte reserves the granule for the file until the first record is written. Why did they choose this method? Disk BASIC design philosophy stressed speed. The GAT is loaded into and read from RAM to speed up GAT intensive operations. The fastest way to define a zero record count and reserve additional granules using only the GAT is by marking them \$C0.

On another subject, I have written several professional grade programs for the DISTO 80-column adapter. Interested parties may write to me at P.O. Box 126, 06403, or call (203) 723-8237.

John C. Gazy  
Beacon Falls, CT

### Cold Shoulder for EDTASM+?

Editor:

Thank you for William Frame's letter in the April 1986 issue [Page 7]. I have well over \$2,000 in my CoCo and all I see is more money going out.

EDTASM is a good program. I've used all of Mr. Schrag's patches, so I have Disk EDTASM+. But, what good is it? All that time and I can't use the *Digital Aquarium* program. Heck, I can't even use D. Lendowski's Vaders!

Maybe what this shows is that Tandy makes the computer but that's it. Face it, a beginner is going to choose EDTASM because of the cost. We are not all machine language programmers.

I can't say anything bad here. You do what you must, but there are thousands of us with EDTASM+ only.

When Bill Barden, Jr. says EDTASM+ is what we're going to use... well, that shows me the program is not junk and it deserves more respect than it gets.

Will Computerware's Macro Assembler plus XREF (Disk BASIC) allow me to assemble the *Digital Aquarium* listing, which was written on the Micro Works 80C? How do I get *Micro Illustrator* to SAVEM to another disk or get the pictures dumped to my CGP-220? I have OS-9. Do I have to get OS-9 screen print utilities? There's nothing in the instructions or program that tells how to get a printer dump. Please help! My address is 525 6th Avenue N #1, 59401.

Jay Thomas  
Great Falls, MT

### RAINBOWfest Praised

Editor:

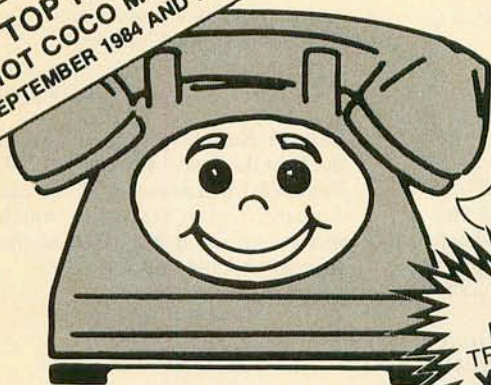
This is to say thanks for having RAINBOWfest in Palo Alto. That made it possible for my daughter and me to attend our first one. We enjoyed seeing some of the faces that go with the names on the articles we read. Please don't let the unfortunate weather keep you from having another one in northern California.

I want everyone to know about Moreton Bay Software. John Nielson and his company put customer service and satisfaction above everything else, whether in person or over the phone. You can count on them to resolve any problems. The *Hotslot* program is great fun for us would-be high-rollers!

Norma V. Doyle  
Alameda, CA



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Graham, *RAINBOW*, 6/83

"The AUTOTERM buffer system is the most sophisticated — and one of the easiest to use..."  
Banta, *HOT CoCo*, 9/84

"Almost a full featured word processor..."  
Eilers, *RAINBOW*, 11/84

"AUTOTERM's excellent error-handling routines, thorough documentation, and logical, easy-to-use command structure make it stand out."  
Parker, *HOT CoCo*, 5/85

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Phyllis.



## HINTS AND TIPS

Editor:

I would like to inform Canadian CoCo users of the ACCESS Timesharing System. It is similar to Delphi and CompuServe only it's Canadian and much cheaper. The cost is \$5.95 an hour CDN including all charges. There is a special CoCo SIG on the system so we can all communicate. To log on, call up your local Datapac number and type the following:

```
49700019 (ENTER)
(ENTER)
HELLO DEMO.DEMO (ENTER)
```

This gives a description of the system and the option of signing up online. You may also call them at (514) 342-8147. I hope to see more CoCo users on the system soon.

Kanti Dinda  
Kingston, Ontario

## Printer Upgrades Available

Editor:

RAINBOW is great! In the March issue you printed my question and soon after I got five good answers.

I asked for information on an upgrade for the Epson RX-80 printer to allow it to print near-letter quality as in the current LX-80 model. Here's where you can get an upgrade kit for \$59.95: Dresselhaus Computer Products, 837 E. Alosta Ave., Glendora, CA 91740, phone (818) 914-5831. The product is called the "Fingerprint Letterwriter." Kits are also available for the Epson FX series for \$79.95.

Paul Whiting  
Madison, WI

## Timing Subroutines

Editor:

Here's a tip on timing subroutines. First, type in and run:

```
10 TIMER = 0
20 X = TIMER
30 PRINT X
```

This gives a readout in  $1/60$  seconds of how much overhead the test lines take. Write it down. Insert program subroutine between lines 10 and 20 (put them into the program at odd-numbered positions so they can be removed later). Subtract the overhead (first figure obtained) from the second figure. This tells how long the routine takes to run in  $1/60$  seconds. Multiply by 60 to get seconds. This could be included in Line 30.

B.R. Pogue  
Lake Havasu City, AZ

## RAINBOW ON DISK Vote

Editor:

I heartily endorse the suggestion to have a RAINBOW ON DISK subscription. I also request that you publish a comparison chart

for database manager programs, similar to that done for printers a few issues back.

James M. Green  
Jacksonville, FL

## Belated Congratulations

Editor:

What happened to "CoCo Cat" in the April 1986 issue of RAINBOW? Has he run away? I see that Jerry McKiernan has been promoted from assistant art director to art director beginning with the February 1986 issue. A belated congratulations!

William T. Grace  
St. Joseph, MI

## REQUEST HOTLINE

Editor:

I am interested in purchasing any trivia on cassette tapes. I have searched all over and can only find them on floppy disks. Please help. Write to me at 25517 Yale, 48125.

Steve S. Massey  
Dearborn Heights, MI

## Can You 'Spare' any Bowling Software?

Editor:

I am trying to locate software to handle my bowling league records. I would also like to be able to keep records for tournaments in which three, four or five games are bowled. I have a 64K CoCo. If you or any of your readers have such a program or know where this type of software is available please let me know. I would be interested in hearing about or seeing a sample printout of bowling league software. My address is 2416 Main Street, P.O. Box 78, 44856.

Nancy F. James  
North Robinson, OH

## Ups and Downs

Editor:

I have been following biorhythms for several years now using a book written by Bernard Gittelson entitled *Biorhythms — A Personal Science*. I have found several programs in other computer magazines that profess they have a program for biorhythms, but to no avail. These programs don't even come close to comparing to the charts in Gittelson's book. Perhaps you have a past issue of your magazine that has a program for a biorhythm chart. My address is 1101 Tyler, #23, 66612.

R.D. Phillips  
Topeka, KS

Editor's Note: See the reviews "Biorhythm and Mine Field" February 1982, Page 10 and "Biorhythm" June 1982, Page 52. Also "How's Your Day? Need Biorhythm help?" November 1981, Page 6.

## Family Ties

Editor:

I am looking for a good genealogy program for a 64K Color Computer 2...

Kyle Johnson  
Cantment, FL

Editor's Note: We suggest "All in the Family Tree," February 1984, Page 78 or *Ancestors 2.0* from Autumn Color Software, which was reviewed on Page 218 of the November 1984 issue.

## New Address

Editor:

If anyone has questions about or wants a copy of my program, *Guppy Graphics*, from the October 1985 issue, Page 106, send \$6 to my new address: 739a 16th Avenue, 94118. I'm sorry the RAINBOW ON TAPE version didn't work. Also, I hope you put out RAINBOW ON DISK soon.

Jim Kent  
Dancing Flame Software  
San Francisco, CA

## Delphi Line

From: BOSIB::COLOR  
To: EDITORS  
Subj: IDEA

How about a section for "K-BYTERS"? They are small programs like one-liners, but can have any amount of lines in them and can only take up 1K of memory.

Royal O'Brien  
Riverside, NJ

## INFORMATION PLEASE

Editor:

After many hours of trying to modify the screen dump for the excellent *CoCocad* program by Peter Kerckhoff (October 1985, Page 130), I give up.

Mr. Kerckhoff was of great help in sending me the modifications for the DMP-type printers, however, even those did not work with my DMP-105. The modification printed in THE RAINBOW (February 1986) will not work using my DMP-105 printer. I would like to know if anyone has made a machine language print routine that works using the DMP-105 printer for *CoCocad*. My address is 1137 Caddock, 68008.

R.W. Harper  
Blair, NE

## A Touching Request

Editor:

I just purchased a touch pad. They come with almost no documentation. I would greatly appreciate it if someone could send



me some information and/or program suggestions. Send information to 741 Alicia Walk, Apt. E, 44306.

Keith Selbee  
Akron, OH

**Editor's Note:** See "Joysticks, Touch Pads and Digitizing the World" on Page 224 of the January 1986 issue.

### OS-9 Upgrade

**Editor:**

I bought my 64K Extended BASIC CoCo 2 about five months ago. Your magazine has encouraged me to upgrade with an FD-500 disk drive and a DMP-105 printer. And I have also made the commitment to OS-9.

I am using the tape version of *Elite\*Word* and I plan to upgrade to the OS-9 version soon. But, there are times when the program hangs up and I see a rampant cursor bar flashing back and forth on the last line of text. If anyone is using *Elite\*Word* OS-9, I would appreciate hearing from them, since I am not sure which OS-9 word processor to use. Write to me at 10-B Summer Street, 94102.

Shawn Thomas  
San Francisco, CA

### Get in Touch

**Editor:**

I would like to contact someone who has a communication program for the DCM-3 modem. I have the *Color Disk Scripsit* for the DMP-105 printer, and I also have some games for the CoCo. Anyone interested please write to me at 4421 NW Second, 33126.

Walter Traini  
Miami, FL

**Editor's Note:** Any communications package should work.

### Voltage Change

**Editor:**

I now have a Disk Extended Color BASIC 1.0, 32K CoCo. I bought a new CoCo 2 and cannot get my disk to operate. I understand they have changed the voltage to the control. Is there some way I can adapt my old control to operate with the new CoCo 2?

Ronald M. Pierce  
Ft. Lauderdale, FL

**Editor's Note:** Tony DiStefano describes how to build a 12-volt power supply for the CoCo 2 in the April 1984 issue on Page 149.

### Using DMP-105 Fonts

**Editor:**

I have found Tandy's *Color Scripsit* to be very useful. However, I was disappointed when I found it impossible to utilize the various fonts available from my DMP-105 printer. Am I missing the obvious or has anyone found a way around this problem?

Jerry Dummer  
Los Alamos, NM

**Editor's Note:** You might try poking control codes to the printer immediately before running *Scripsit*. This assumes you are using the disk version of *Scripsit*.

### Calling Modem Programmers

**Editor:**

I recently bought a Radio Shack DCM-5 modem. The manual says the modem can be programmed for automatic operation. It describes automatic as "having the modem call another computer at a desired time." I would like to use this feature to transmit files, but I don't know how. I don't know assembly language and the modem can only be programmed when it is in a terminal program with the settings at seven data bits and full duplex. If anyone knows how to do this, please let me know. My address is 435 8th Street NE, 33881, phone (813) 293-5648.

Thomas C. King  
Winter Haven, FL

### Double Duty Drive

**Editor:**

Please tell me if it is possible to use both sides of a double-sided disk in a single-sided disk drive. I have a Radio Shack slim-line Drive 0 and I've tried cutting the write-protect notch on the opposite side of the disk. I've been able to cut a pretty good duplicate of the notch on the other side and in the correct location. My 64K CoCo keeps telling me I/O Error when I try to format that side of the disk. I've heard of people who have single-sided disk drives using both sides of double-sided disks. How can this be done?

Jose Garcia  
Mooresville, NC

**Editor's Note:** See "Downloads," April 1986, Page 225, for the answer to this question in reply to a letter from Kevin Gibson.

### EPROM Changes

**Editor:**

Is there any program for the CoCo so when it is turned on it automatically loads a program from disk? If anyone has any program like this, I can be reached at #8 Sylvan Heights, 52601.

Scott Lindsey  
Burlington, IA

**Editor's Note:** Check out our "Cooking with CoCo" series beginning in July 1984 and ending in February 1985. What you want will require that the changes this series makes be burned into an EPROM.

### Reading Bar Codes

**Editor:**

Where can I get a Bar Code reader that is usable on my upgraded CoCo 2 with double disk drive? I prefer a wand, although

other versions might do. I want to scan, then print out information with a small Tandy thermal printer. Write to me at 2927 Allen, 63104.

Barbara Gardner  
St. Louis, MO

### Selling Programs

**Editor:**

I am an assembler at an electronics firm and have written a program to print the disk directory. I would like to sell the program but I don't know how to go about it. Any advice would be a great help.

James C. Anderson  
Ft. Atkinson, WI

**Editor's Note:** We suggest you call or write to the various software houses. You might find one who might be interested. You are always invited to send it to us. See "Submitting Material to Rainbow" on Page 120 of this issue.

### KUDOS

**Editor:**

A special thanks to Fred Scerbo for his *Title Maker* program [Page 157] in the March 1986 issue. I had been unsuccessfully trying to do that with joystick and keyboard programs. I am the membership director for the London CoConuts Computer Club and we promote your magazine whenever possible.

Doug Tompkins  
London, Ontario

### BULLETIN BOARD SYSTEMS

**Editor:**

I would like to inform your readers of my COBB's BBS #41. It is online from 8 a.m.-8 p.m., CST, seven days a week, 300 Baud, no parity, eight bits and one stop bit. The number to call is (501) 857-3138.

Perry Parsons  
Corning, AR

• This is to announce a new BBS. The Classified Connection is online 24 hours a day at (619) 566-1745. Users may access 300 Baud only. The board is primarily dedicated to TRS-80 Color Computer users. The emphasis being buy/sell/trade hardware and public domain software and assorted other articles in a swap-and-shop forum. There is a unique art forum for the submission of public domain artwork written by Color Computer users and downloadable in XMODEM format.

Bill Kennon  
San Diego, CA

• Our TBBS is running 11 various CoCo sub-boards with four separate up/download software bases. Members receive a monthly newsletter that contains a BBS list, pokes page, news section with the latest happenings from CompuServe, Delphi and other branches of the CoCo world. We will also be holding monthly meetings where



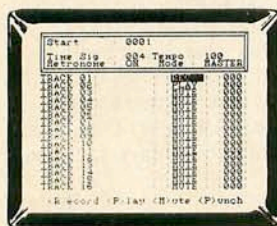
# What Happens When You Own A COLORCHESTRA™ MIDI SEQUENCER?

*All Of A Sudden, Synthesized Music Production,  
Editing And Recording Becomes Very, Very Simple.*

**COLORCHESTRA**, (from the author of CoCo MIDI), links together your Tandy 64K Color Computer and MIDI equipped keyboard synthesizer or rhythm drum machine and makes it simple to create masterpieces of music.

By incorporating menus and graphic icons, all there is to recording in real time is pushing a few keys.

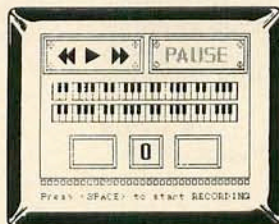
A. Select track recording icon.



C. Simply play keyboard and hit break key when done.



B. Select starting measure, time signature, tempo and recording track.



## THAT'S IT!

Once the track is entered, auto correction, transposing, and filtering may be implemented. And **COLORCHESTRA™** works with you to record up to **8,000 notes** utilizing as many as **16 tracks**...awesome.

But it doesn't stop here - **COLORCHESTRA™** is crammed with a myriad of other outstanding professional features...

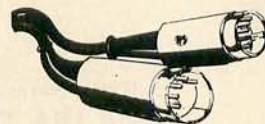
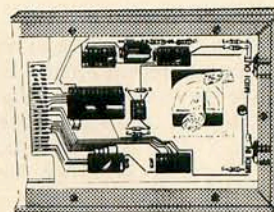
- ✓ Solo capabilities on any track.
- ✓ Tempo range from 30-250 beats per minute
- ✓ Audible and visual metronome
- ✓ Programmable measure locator
- ✓ Sequencer will record from any MIDI Channel (1-16)
- ✓ Each track can output to any MIDI channel (1-16)
- ✓ Records full spectrum of MIDI data including program changes, pitch bends, all 128 MIDI controllers (modulation wheel, breath controller, sustain pedal, etc.)

- ✓ Will sync to drum machines
- ✓ MIDI thru on input
- ✓ Programmable time signature
- ✓ Track looping capability
- ✓ Real time velocity modification
- ✓ All 16 tracks can be titled
- ✓ Software filter removes specific MIDI parameters from recorded music such as pitch bend, program change, velocity data, modulation wheel, MIDI controller
- ✓ Simple music text editor
- ✓ Transposition of notes up or down any number of octaves in half steps
- ✓ Auto correct feature for timing errors
- ✓ Stores composed music on tape or diskette
- ✓ Works with any disk operating system (Radio Shack, JDOS, ADOS, etc.)

## THE COLORCHESTRA SYSTEM PACKAGE

### HARDWARE

Encased between clear plastic panels and hand finished american walnut is **COLORCHESTRA's** sequencer board. Not just the edge connector, but every circuit trace is plated in 7 mil gold for optimum interface connection.



Two dependable, heavy duty 8' MIDI cables with metal jacketed end connectors are included.

### SOFTWARE MEDIA

In addition to the hardware cartridge and cables, the **COLORCHESTRA™** System Package includes type set documentation in its own ring binder for easy reference and updating.

And for your convenience, both tape and diskette are supplied-so, if you need a back up it'll be there.



**COLORCHESTRA™**. A simple answer to your MIDI music production and **HORIZON** puts it all together for an introductory price of **149.95.....**

**COLORCHESTRA™** system complete - \$149.95. Call any day (ex. Sun.) to order. We ship same day. We accept check, COD, Visa, Master Card. Shipping add 3.00, COD add 2.00. Louisiana residents add 7.8 sales tax. Call for audio demonstration.

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**HORIZON**  
SOFTWARE CORPORATION

318-942-1938 P.O. Box 289 Opelousas, Louisiana 70570



members can access our program library. For more information call (408) 867-2823 (Allan Schaffer), (408) 923-2967 (John Say) or our TBBS at (408) 253-6293.

*John Say  
San Jose, CA*

• Would you please announce the completion of The French Underground BBS. Its down time is weekdays 3 p.m.-7 p.m. (Central time zone) and weekends 10 a.m.-7 p.m. The number is (319) 388-0381.

*Dave France  
Davenport, IA*

• Fast Trackin' BBS has a new phone number. Call me at (502) 365-7771. We are still in operation 24 hours a day; currently running at 300 Baud.

*David Guess  
Princeton, KY*

• Bob's Corner BBS is up 24 hours a day. It is a Colorama Version 3.04 and has been running over a year. It has a small users log of 70 callers. We have online games, up/downloads, full magazine, graphics, story, large message base, open club section and a sub-BBS for amateur radio operators. Call (617) 889-0777 BBS, (617) 889-0056 Voice.

*Bob Bohn  
Chelsea, MA*

• The Frisky CoCo BBS is a 300/1200 Baud system, online 24 hours a day, seven days a week and has downloads of all kinds. It is an extensively modified Colorama (Ceretek Inc.). Call (816) 436-2904.

*Jerry Oliver  
Kansas City, MO*

• Introducing Colorama, online from 7 p.m. to 12 midnight daily. Call (601) 795-8915. For more information call before 7 p.m. for voice.

*Joe Polk  
Poplarville, MS*

• My BBS runs on a 64K 'E' CoCo, four drives, Deluxe Pak, Hayes 1200 and a homemade hardware clock. ASCII and XMODEM transfer is available with 30-40 programs online for downloading along with hints, reviews, bulletins, games and trivia. New users are not limited to any activity except writing on the system. We are up and running 24 hours a day, seven days a week, 300/1200 Baud, eight data bits and can be reached at (603) 485-8682.

*Dave Bean  
Allentown, NH*

• The Hotel BBS operates 24 hours a day, seven days a week. We feature SIG sections such as a health, gourmet, magazine, want ads and a great download section that has Mike Ward's *Mikeyterm 4.0* (c) online to download. Give us a call at (718) 381-2209.

*Mike Sileo, Jr.  
Glendale, NY*

• I would like to inform your readers of a BBS in the Westchester-Rockland-Putnam area. The BBS supports a variety of systems including CoCo. It includes many SIGs and even a UFO section. The boards are up from

6 p.m.-7 a.m. weekdays and 24 hours on weekends; has a download section for CoCo and IBM. Call (914) 776-2424.

*Jolly Roger  
Lake Carmel, NY*

• Announcing The Utopia Network #1 BBS. We are using our own written software. To log on use 300 Baud, full duplex and even parity. We have over 200 programs available for download and several other features. The hours of the BBS are from 7 p.m. to 6 a.m. every evening.

*Bruce Uher  
Coshocton, OH*

• I would like to announce a BBS called the FUN BBS. It has movie reviews, top 10 music, supports up/downloading, has on-line games and more. It runs on a three-drive CoCo with 64K. The number is (412) 378-7825 and is usually up 24 hours a day.

*Robert Chalupa  
Aliquippa, PA*

• I would like to announce the changing of CoCo Palace's number. The new number is (615) 581-9752. Voice calls will be taken on (615) 581-2904. I am changing to a new BBS program. I am also interested in starting a national club for SysOps. Address all correspondence to 936 Hall Drive, 31784.

*Marty Cline  
Morristown, TN*

• The Salt City CoCo Club announces it has a BBS — runs 24 hours a day, seven days a week, 300 Baud, seven bit, no parity. Call The Data Warehouse at (801) 487-6787.

*Salt Lake City CoCo Club  
Salt Lake City, UT*

• Announcing the online operation of the Bellingham CoCo Bulletin board from 10 p.m. to 7 a.m., seven days a week. Call (206) 734-5806.

*Roger Alexander  
Bellingham, WA*

• Announcing Uncle Dave's BBS in operation at 300 Baud, 24 hours a day, seven days a week. Supports up/downloading and various message bases. Call (414) 843-4029.

*David Buehn  
Salem, WI*

• I would like to announce the start of the Wizard's Keep BBS. The number is (604) 752-2480. It runs 24 hours a day at 300/1200 Baud.

*Jason Cikaluk  
Qualicum Beach, British Columbia*

• I would like to inform your readers of the all new Micro Ads BBS. We operate 24 hours a day, seven days a week. Parameters are 300 Baud, eight data bits, one stop bit and no parity. Phone (604) 832-8772.

*David Coldwell  
Salmon Arm, British Columbia*

• CoBBS #63 is online and running 24 hours a day. This system supports up/downloading, two message bases, for sale sections and much more. Call (705) 328-0703. If the system is down for housekeeping, etc., the phone online is not answered to ensure charges are not made.

*Bud Melless  
Lindsay, Ontario*


THE RAINBOW welcomes letters to the editors. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or space.

Letters to the editors may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type SEND and address to: EDITORS.

## ARTS AND LETTERS

BERT A KELSO  
6374 GLENIS  
TAYLOR MI  
48180



I ONLY HAVE  FOR  
**Rainbow**  
P.O. BOX 385  
PROSPECT, KY  
40059

## Envelope of the Month

*Bert A. Kelso  
Taylor, MI*





I have seen a great deal about "desktop publishing" in the past months and, I suppose, the ultimate bombardment came just the other day when we received a baker's dozen promotions for Apple's new Macintosh.

I don't know what it cost to produce the package, but — based on what we pay for much more modest mail campaigns — I would guess it was in the neighborhood of \$10 each. That means Apple spent about \$130 sending Falsoft and its associated companies promotion material trying to convince us that the Mac could be used in place of our typesetting equipment. With the exception of a few printing shops, I know of almost no one who uses the still-very-slow Mac for typesetting.

Hooked up to an Apple LaserWriter printer (which, incidentally, costs much more than an HP or Corona LaserJet) you can get acceptable "type," but at a slow speed. And digitized images are a poor second to photographs. Color? Forget it.

There is, however, a magazine that was founded on the general principle of desktop publishing. You are reading it. For the first year, THE RAINBOW was done entirely with a Color Computer and a dot-matrix printer. Can you still do this? Well, ask all the people who use their CoCo for newsletters of all types.

After several years, I see Apple as still trying to find a niche for its Mac. So far, no go. A computer, after all, has two purposes. The first is to make things easier for its human companion. The second is to make things enjoyable. No one will ever convince me that a Mac does these things best — simply because it works so slowly. And, if it is slow to react, I can hardly say it is enjoyable. Many of Mac's games are good, but good games don't suffice for lack of other attributes.

I think Apple should just let Mac go away quietly. Or reduce the price drastically. And that would be easy: I could have saved them \$130 just by telling them not to send us 13 mailers for something we are hardly interested in using.

\*\*\*

Speaking of mailings, our policy is that we make just one for subscription renewals. No, we're not like some other magazines that run a series of six or so mailings to get your renewal. I always find those renewal notices a bore and "tune out" on them after a while. After all, I figure that, eventually, they make their "last, best offer" and it is silly to renew before then.

We don't take that attitude. Instead, we figure you like THE RAINBOW (most of you seem to) and if you get a notice to renew, you will. We do include a note that says the notice you're getting is the *only* one you'll receive.

Since we seem to have one of the best renewal rates in the industry, maybe we do something right. On the other hand, every month we get notes from people who let their subscription lapse and want us to pick it back up with the issue after the last one they got. This frequently happens when someone sees the new issue on the newsstand or at a friend's home.

We can't do that. The reason we are able to keep our subscription price where it is because we mail all our magazines at the same time on a second class permit. It costs a couple of dollars to mail one first class — and that's more than the profit on a whole year. (Yes, we will mail first class when you miss an issue.)

So, please, send in your renewal notice when you get it. That way, you'll be sure to keep THE RAINBOW coming without a break.

\*\*\*

A few months ago I made a comment in our sister publication, **PCM**, that our cover story (December 1985) on the Tandy 3000 and 600 marked the first time I knew of that Tandy Chairman John Roach had appeared on the cover of a computer magazine.

I was jumped all over by Eric Maloney, editor of *80-Micro*, because his magazine had Roach on the cover a couple of years ago. A correction was duly made in **PCM**. Eric's letter was to the point on the need for accuracy in journalism.

So, it seems fair-to-middlin' strange to see *80-Micro* describe a simple upgrade for the Color Computer as the "long-awaited successor to the Color Computer 2" in its May issue. Talk about negative commentary: *80* went through a short list of all the things Tandy did not change.

One phone call, Eric, would have told you this was not the new Color Computer. It is just an upgrade. Seems everyone knew about it but you.

I am sorry to see this happen, since it reinforces the magazine's disinterest with the CoCo, which dates back years to the time *80-Micro*'s founder and then publisher Wayne Green forecast the "death" of the machine that went on to be Tandy's top seller. I am even more sorry because now that *Hot CoCo* has folded, *80* purports to support the CoCo.

To paraphrase Henny Youngman: "Support like this, I don't need."

— Lonnie Falk



# Telewriter-64™

## the Color Computer Word Processor

- 3 display formats: 51/64/85 columns × 24 lines
- True lower case characters
- User-friendly full-screen editor
- Right justification
- Easy hyphenation
- Drives any printer
- Embedded format and control codes
- Runs in 16K, 32K, or 64K
- Menu-driven disk and cassette I/O
- No hardware modifications required

### THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...

— Color Computer News, Jan. 1982

### TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

### 64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

### 64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

### RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

### FEATURES & SPECIFICATIONS:

**Printing and formatting:** Drives any printer (LPV/II/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Termet, etc).

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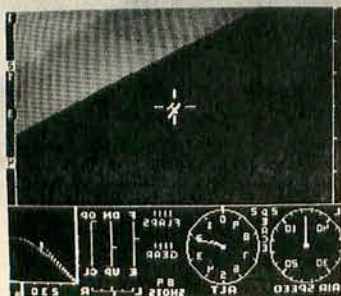
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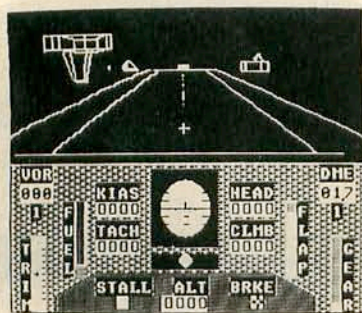
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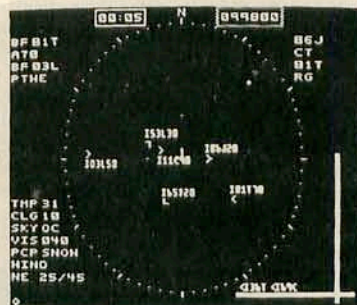
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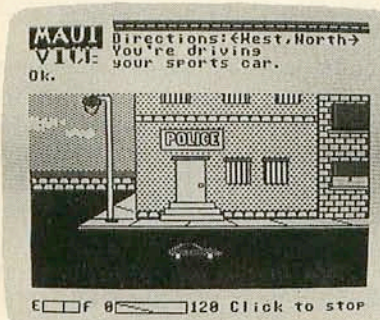
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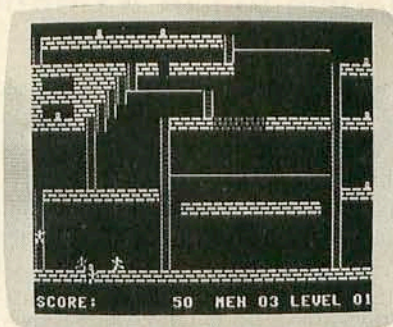
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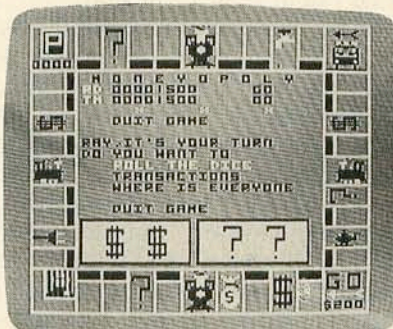
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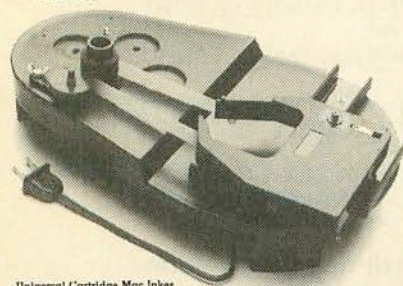


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## BUILDING JUNE'S RAINBOW

### Welcome to CoCo Country

**R**ecently, we were calling people throughout the building to come hear some movin', groovin' CoCo musical arrangements. I taunted the managing editors of our sister publications with, "Let's see your machine match that!" Rock 'n' Roll!

Truly, I had not realized any computer could jam that way — I'm talking driving-beat, get-down sound. CoCo's musical state of the art is a long way from PLAY statement Chopsticks. Unfortunately, for several selections, the "listing" (if one even existed) would run many magazine pages and would be helpful only to those who happen to have a given CoCo composer program.

Luckily, we also have solid material that can be shared. But, since these arrangements are all quite long, what we have done is run enough of the program code in the magazine to play the first few bars, to show you how it's done, and then included the entire file on RAINBOW ON TAPE. We don't like to put anything on RAINBOW ON TAPE that isn't in the magazine, but we believe you'll understand and forgive us this slight transgression, since doing otherwise would deprive you of some great stuff.

Carrying our departure from the norm a bit further, we also included some non-CoCo-generated music on this month's RAINBOW ON TAPE. We think that "Shadow of the Rings" by Becky and Dave Matthews is quite well done and, since it is their own original work, we have reproduced it on our tape service to go along with the graphics they also created. A quite intriguing, off-the-wall, multi-media work, I think you'll agree.

So, music takes many forms with the CoCo. One area that seems to be overlooked, however, is music about the CoCo! I mean, why not? I have an entire record album of C.B. radio songs that are so hokey I consider them classics. And, every time our Music and Sound issue of THE RAINBOW rolls around, I chide myself for not having written at least one tongue-in-cheek, just-for-fun CoCo song.

You see, I do have some songwriting credentials — however shaky or suspect they may be. A decade ago, former RAINBOW senior editor Courtney W. Noe and I put our middle names together and the country music team of Willard and Earl was born. Out of that concerted, two-week venture came "Come on Over for a Pick-Me-Up, My Woman Just Put Me Down" and the ever-popular "They Got Tums for the Tummy, and Contact for Your Cold, But There Ain't No Pain Reliever for the Soul," plus some lesser-known hits.

My creative inspirations always lean toward that lyin', dyin', cheatin', cryin' life-in-the-emergency-lane music. And, the way we carry on about our CoCo, it's time we set our words to music. How about "Ballad of the CoCo Widow," or "I'm Proud to be a CoCo-LoCo's Daughter," huh, huh? Let's see, "The Keyboard Bounce Blues"? Maybe not. Or, "Send Me the EPROM You Just Burned In." Whew, baby. Heavy stuff, eh! Here's a bound for glory classic, for sure: "I Dreamed I Was There in Hardware Hacker Heaven."

No, this isn't a contest. But, if you send in a goody, and Lonnie's out of town a few days, it just might get printed. Heck, send us just the title if you want; if it brings a chuckle, or twangs the old heart strings, we'll share it with the CoCo World. No reason it has to be country, but don't count on getting into the Tom T. Hall of Fame with some punk rock stuff!

Yee-Hah! I'm on a roll now, "These Boots Are Made for DOSes," or "I've Forgotten More Than You'll Ever Know About C." Look out Nashville! "You Gotta Walk That Silicon Valley" sounds Top 40 to me. How about "Does RFI Sometimes Waver Through the Bedposts Late at Night?" Or, "I'm Proud to be a CoCo-ee from Muskegoe." Or . . .

Ending with my usual refrain: To keep up with the beat and in tune with the times, I invite you to join with those who subscribe to THE RAINBOW (Use our new orders only toll free number: 800-847-0309). We celebrate our fifth anniversary next month — We were CoCo when CoCo wasn't Cool!

— Jim Reed



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# Nothing Phone-y about It: Ma Bell Trips the Light Fantastic

By Becky F. Matthews

**W**elcome to CCTV (CoCo TV)! Before loading this program type PCLEAR B (to free two Hi-Res graphics screens), then load *OnHold*, run it, and feel free to sing along. This is a simple animation program with telephones dancing to music, but the results are quite entertaining. The speed-up POKE is used in Line 10, so be sure to delete it if your computer won't handle it. There are two kinds of music statements and two kinds of animation used in *OnHold*.

Lines 55-85 use the text screen to print the words to the song chorus and sound the appropriate note for each word.

*Becky Matthews and her husband, David, live in Nashville, Tennessee, and do free-lance work in electronics, computers and music.*

Lines 90-190 draw one telephone on Hi-Res graphics screen PMODE 4,1. GET it and use PUT to "stamp" seven more phones on the screen. Lines 125-135 paint the phones. Line 145 copies the phones to the second graphics screen, PMODE 4,5. Line 160 draws straight legs on the PMODE 4,5 phones. Lines 170-180 draw legs in various dance positions on the PMODE 4,1 phones.

Lines 195-250 comprise the "slow dance" routine. This routine is performed four times (Variable P in Line 200). Using GET, a phone is chosen randomly from the PMODE 4,1 screen (lines 200-205) and is "stamped" using PUT (Line 225) to each phone position in PMODE 4,5. Each time this routine takes place, 'Y' is decremented by two (Line 210). This moves the rows of telephones higher on the screen. When 'Y' is less than 33, the screen is cleared with Color C (Line 215) and the next phones return to their original screen

position (Y = 40). Line 230 sets 'Y' up to PUT the bottom row of phones. Line 235 sets 'Y' back to the top row of phones.

Lines 255-265 make up the "fast dance" routine, which simply flips between PMODE 4,1 and PMODE 4,5. To change the speed of the fast dance, change the value of 'T' in the two timing loops in Line 260. Variable S tells how many times the pages are flipped. Subroutine 270 (lines 270-280) makes a telephone ring sound effect.

Line 50 causes the dance sequence to start again (GOTO 30), so use BREAK to stop the program when you've seen enough dancing telephones. Don't forget to type POKE 65494,0 when you're done to slow the CoCo back to normal speed.

(Direct questions about this program to the author at 2415 Smith Springs Road, Nashville, TN 37217. Please enclose an SASE for a reply.) □

## The listing: ONHOLD

```
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  SONG "DON'T PUT ME ON HOLD" COPY
  RIGHT 1985 B. & D. MATTHEWS
10 POKE65495,0 '*SPEED-UP POKE
15 DIMW(87)
20 GOSUB55 '*SONG CHORUS
```

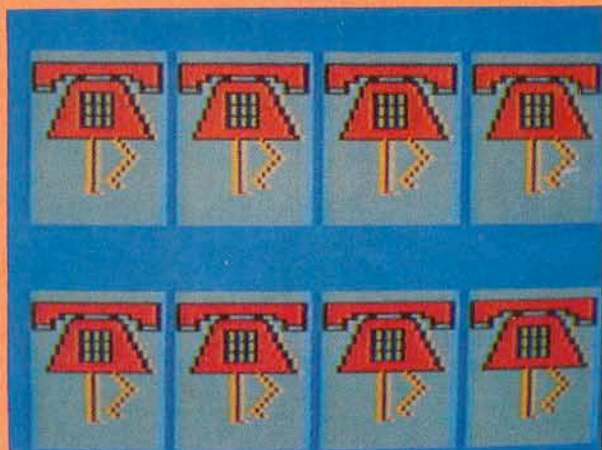
```
25 GOSUB90 '*DRAW PHONES
30 GOSUB255 '*FAST DANCE
35 GOSUB270 '*PHONE RING
40 GOSUB195 '*SLOW DANCE
45 GOSUB55 '*CHORUS
50 GOTO30 '*START ROUTINE AGAIN
55 '***SONG CHORUS SUB
60 CLS4:PRINT @ 105,"DON'T";:SOU
```



```

ND 108,4:PRINT @ 305," ";:PRIN
T @ 175,"PUT";:SOUND 133,2:PRINT
@ 235,"ME";
65 SOUND 133,2:PRINT @ 305,"ON";
:SOUND 147,4:PRINT @ 362,"HOLD!"
:SOUND 32,4
70 CLS8:PRINT @ 100,"DON'T";:SOU

```



```

ND 147,4:PRINT @ 172,"PUT";:SOUN
D 147,2:PRINT @241,"ME";:SOUND 1
47,2:PRINT @ 308,"ON";:SOUND 133
,4:PRINT @ 375,"HOLD!";:SOUND 14
7,4
75 CLS3:PRINT @ 104,"AND";:SOUND
108,4:PRINT @ 143,"DON'T";:SOUN
D 133,4:PRINT @ 235,"HANG";:SOUN
D 147,4:PRINT @ 305,"UP!";:SOUND
32,4:FORT=1TO210:NEXTT
80 CLS4:PRINT @ 106,"DON'T";:SOU
ND 147,4:FORT=1TO290:NEXTT:PRINT
@ 205,"HANG";:SOUND 133,4:PRINT
@ 305,"UP!";:SOUND 108,4
85 RETURN
90 '***DRAW PHONES SUB
95 PMODE4,1:PCLS1:SCREEN1,1:PMOD
E3
100 DRAW"BM20,70CL58NR20M+5,-10R
1U1R1D1R6U1R1D1R1NM+6,+10BU1R2D1
R2D2R4U1NL4U4L26D4NR4D1R4U2R2U1R
4NR6BD3NR6D2NR6D2NR6D2R2NU6R2NU6"
105 '***"STAMP" PHONES USING GET/P
UT
110 GET(15,40)-(70,70),W,G
115 FORY=40TO125STEP85:FORX=15TO
195STEP60:PUT(X,Y)-(X+55,Y+30),W
,PSET:NEXTX:NEXTY
120 '***PAINT PHONES
125 FORY=47TO132STEP85

```

```

130 PAINT(30,Y+18),2,1:PAINT(30,
Y),2,1:PAINT(90,Y+18),3,1:PAINT(
100,Y),3,1:PAINT(150,Y+18),2,1:P
AINT(150,Y),2,1:PAINT(210,Y+18),
3,1:PAINT(210,Y),3,1
135 NEXTY
140 '***COPY PHONES TO PMODE4,5
145 FORP=1TO4:PCOPYP TO P+4:NEXT
P
150 PMODE4,5:SCREEN1,1:PMODE3,5
155 '***DRAW STRAIGHT LEGS
160 DRAW"C2BM36,70D10L1BR8L1U10B
R23C3D10L1BR8L1U10BR25C2D10L1BR8
L1U10BR23C3D10L1BR8L1U10BD43D10R
1BL7NL1U10C2BL23D10NR1BL7R1U10BL
25C3D10NR1BL7R1U10BL23C2D10NR1BL
7R1U10"
165 '***DRAW "CRAZY" LEGS
170 PMODE4,1:SCREEN1,1:PMODE3,1
175 DRAW"C2BM36,70G8H1BD3BR14R1N
U10C3BR24L1U10BR6F8E1C2BR8F1E8BR
4F8E1C3BR16BD3L1U10BR5F6L6D1"
180 DRAW"C2BM37,156G4F4G1BR4R1NU
10C3BR28L1U10BR4F4G4F1C2BR25E1H4
E4BR2F4G4F1BR24BU8C3G6R6D1BR5BD3
R1U10"
185 C=2:Y=40
190 RETURN
195 '***SLOW DANCE SUB
200 FOR P=1TO4:PMODE4,1:R=RND(2)
-1:H=40+(R*85):S=RND(3):X=13+(60
*S)
205 GET(X,H)-(X+56,H+60),W,G
210 Y=Y-2
215 IFY<33THENY=40:PMODE4,5:SCRE
EN1,1:PMODE3,5:PCLSC:C=C+1:IFC>8
THENC=2
220 PMODE4,5:SCREEN1,1
225 FORX=13TO220STEP60:SOUND 226
,1:PUT(X,Y)-(X+56,Y+60),W,PSET:N
EXTX
230 IFY<=40THENY=Y+85:GOTO220
235 Y=Y-85
240 NEXTP
245 FORT=1TO1000:NEXTT
250 RETURN
255 '***FAST DANCE SUB
260 FOR S=1TO18:PMODE4,1:SCREEN1
,1:SOUND 235,1:FORT=1TO150:NEXTT
:PMODE4,5:SCREEN1,1:SOUND 237,1:
FORT=1TO150:NEXTT:NEXT S
265 RETURN
270 '***PHONE RING SUB
275 FORR=1TO2:FORX=1TO4:PLAY"T25
5V31A1P1B1P1A1P1B1P1A1P1B1":FORT
=1TO70:NEXTT:NEXTX:FORT=1TO250:N
EXTT:NEXTR
280 RETURN

```



*This program sets the songwriter's stage by providing blank sheet music — you just fill in the notes . . .*

# The Music Maker's Accompanist

*By Barry McNeice*

**M**usic Paper uses the dot-addressable mode to print blank sheet music with the DMP-105 printer.

Data statements for poking the title screen are tucked away at the end of the program. Line 30 reads past the main body of data, so the title screen POKES are read only once.

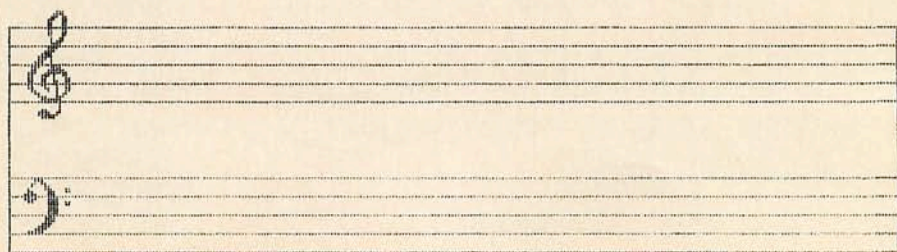
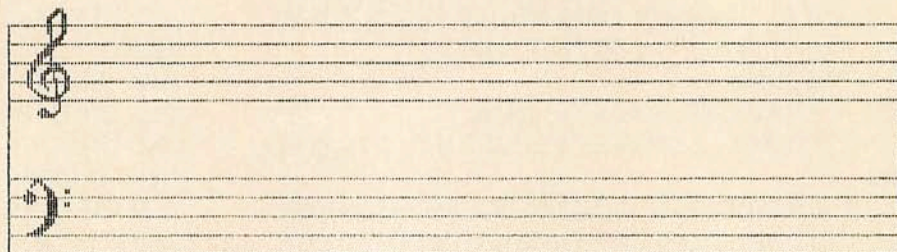
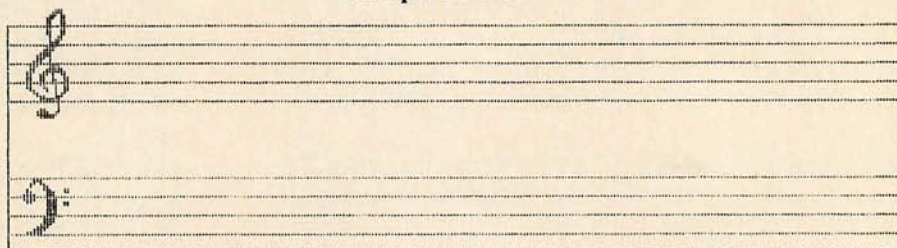
Line 70 checks to make sure the printer is ready. I got this helpful hint from Justin Snyder in the December 1984 RAINBOW letters section. The routine for "freehand drawing" in lines 150 through 230 was taken directly from the DMP-105 owner's manual.

Each page holds five lines of music with bass and treble clefs. There should be plenty of room between lines for lyrics to your song. I hope this program helps make song writing just a little easier.

(You may direct questions about this program to the author at P.O. Box 1248, Yakima, WA 98907, phone 509-457-8865 from 8 a.m. to 5 p.m. PST. Please enclose an SASE when writing.) ☐

*Barry McNeice lives in Yakima, Washington, and is employed as a rubber stamp maker. A novice programmer, his hobbies include music and the CoCo. He is involved with the Yakima CoCo Special Interest Group.*

## Sample Printout





# Introducing

# CoCo Max<sup>TM</sup> II

There is absolutely nothing else on the Color Computer that is comparable to CoCo Max's power and ease of use. The most enjoyable time with a computer I ever had.  
- **Computerware Review May 1985**

CoCo Max is the most incredible product ever marketed for the CC. No review can do it justice. I've never given any product a 10...I give Colorware's CoCo Max (Hardware, Software and Documentation) a 10!  
- **Color Chronicle Vol III #6**

I never expected to see anything like it on my CoCo screen. There isn't a single command to remember. Even a person who has no drawing ability like myself can create a presentable picture. I've spent hours just doodling enjoying all the things from silly to the serious. Fascinating experience. Buy it, you won't be sorry.  
- **6809 Express May 1985**

An outstanding program that almost turns your CoCo into a replica of the Macintosh. Terrific hi-res color, very easy to learn and use.  
- **Family Computing February 1986**

CoCo Max puts fun back into computing, offering a state of the art environment you find on much more expensive machines. Colorware has invested the kind of time and research that virtually secures its success, and that shows up on your screen.  
- **Hot CoCo July 1985**

The pack is well constructed, the user's manual is complete with illustrations and well organized. An outstanding buy for the performance. Colorware's advertisement accurately describes the product. Their delivery was timely as promised.  
- **Rainbow June 1985**

**These were reviews of CoCo Max I.  
CoCo Max II will blow your socks off  
with even more power !**

- New bidirectional shrink and stretch
- New rotate function
- 9 new fonts (for over 200 timesteps)
- A new "Glyphic font" of small pictures
- A 68 page scrapbook
- Point and click to load files (no typing)
- Full error reporting, crash proof
- Custom patterns can be saved
- Printing in color (with CGP 115 or 220)
- Much more. (Note: CoCo Max II is available on disk only)

The reviews are nice, but see it for yourself\* and draw your own conclusion.

\*If you are not delighted with your CoCo Max II, we will immediately refund your purchase, including postage back.

**COLORWARE**

Call Toll Free 800-221-0916.

For more information on  
CoCo Max, turn the page.



# CoCo Max II<sup>TM</sup>



**You'll use it all the time and love using it.**

## What is CoCo Max?

Simply the most incredible graphic and text creation "system" you have ever seen. A Hi-Res Input Pack (more on the pack later) is combined with high speed machine language software. The result will dazzle you.



CoCo Max disk system, with Y-cable.

## Is CoCo Max for you?

Anyone who has ever held a pencil or a crayon for fun, school or business will love it. A 4 year-old will have fun doodling, a 15 year-old will do class projects and adults will play with it for hours before starting useful applications (illustrations, cards, artwork, business graphics, flyers, charts, memos, etc.) This is one of the rare packages that will be enjoyed by the whole family.

## What made CoCo Max an instant success?

First there's nothing to learn, no syntax to worry about. Even a child who can't read will enjoy CoCo Max. Its power can be unleashed by simply **pointing** and **clicking** with your mouse or joystick. With **icons** and **pull down menus**, you control CoCo Max intuitively; it works the same way you think.

Don't be misled by this apparent simplicity. CoCo Max has more power than you thought possible. Its blinding speed will astound you.

It lets you work on an area 3.5 times the size of the window on the screen. It's so friendly that you will easily recover from mistakes: The **undo** feature lets you revert to your image prior to the mistake. As usual, it only takes a single click.

Later, we will tell you about the "typesetting" capabilities of CoCo Max II, but first let's glance at a few of its graphic creation tools:

With the **pencil** you can draw free hand lines, then use the **eraser** to make corrections or changes. For straight lines, the convenient **rubber-banding** lets you preview your lines before they are fixed on your picture. It's fun and accurate. Lines can be of any width and made of any color or texture.

The **paint brush**, with its 32 selectable brush shapes, will adapt to any job, and make complicated graphics or calligraphy simple. For special effects, the **spray can** is really fun: 86 standard colors and textures, all available at a click. It's like the real thing except the paint doesn't drip.

CoCo Max will instantly create many shapes: circles, squares, rectangles (with or without rounded corners), ellipses, etc. Shapes can be filled with any pattern. You can also add hundreds of custom patterns to the 86 which are included.

The **Glyphics** are 58 small drawings (symbols, faces, etc.) that can be used as rubber stamps. They're really great for enhancing your work without effort.



Pull down menus



Zoom in!

## Control Over Your Work

CoCo Max's advanced "tools" let you take any part of the screen, (text or picture) and perform many feats:

- You can move it around
- Copy it
- Shrink or enlarge it in both directions
- Save it on the electronic **Clipboard**
- Flip it vertically or horizontally
- Rotate it
- Invert it
- Clear it, etc. etc.

All this is done instantly, and you can always **undo** it if you don't like the results.

For detail work, the **fat bits** (zoom) feature is great, giving you easy control over each pixel.

To top it all, CoCo Max II works in color. Imagine the pictures in this ad in color. If you own a Radio Shack CGP-220 or CGP-115, you can even print your work in full color!

There is so much more to say, such as the capability to use CoCo Max images with your BASIC programs, the possibility to use CoCo Max's magic on any standard binary image file. There are also many advanced features such as the incredible **lasso**.



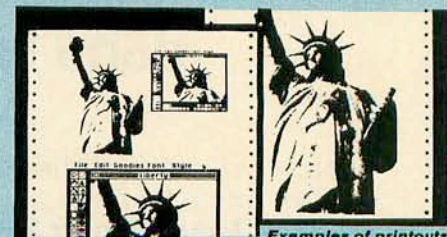
Inside the Hi-Res Input Pack

## Why a Hi-Res Input Pack?

Did you know that the CoCo joystick input port can only access 4096 positions (64x64)? That's less than 10% of the Hi-Res screen, which has 49152 points! (256x192). You lose 90% of the potential. The Hi-Res Input Pack distinguishes each of the 49152 distinct joystick or mouse positions. That's the key to CoCo Max's power. The pack plugs into the rom slot (like a rom cartridge). Inside the pack is a high speed multichannel analog to digital converter. Your existing joystick or mouse simply plugs into the back of the Hi-Res Pack.

## Electronic Typesetting...

You'll be impressed with CoCo Max's capability. Text can be added and moved around anywhere on the picture. (You can also rotate, invert and flip it...) At a click, you can choose from 14 built in **fonts** each with 16 variations. That's over 200 typestyles!



Examples of printouts

## Printing Your Creations

There are a dozen ways to print your work. All are available with a click of your joystick (or mouse) without exiting CoCo Max. Your CoCo Max disk includes drivers for over 30 printers!



# CoCo Max II™

The whole family will enjoy CoCo Max. Here are a few examples of the possibilities.

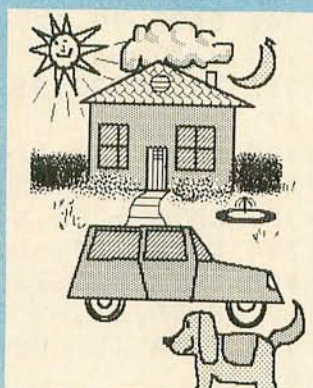
All these pictures are unretouched screen photos or printouts (on an Epson RX-80).



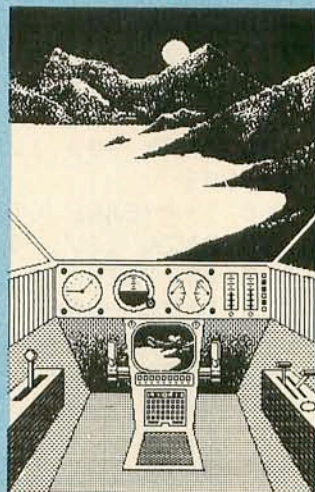
1 Publish a newsletter or bulletin



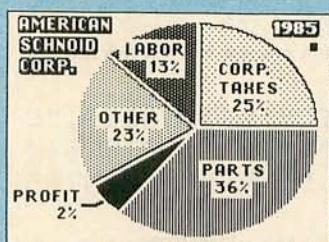
5 Over 200 typestyles to choose from! generate flyers.



2 Fun for children while stimulating creativity.



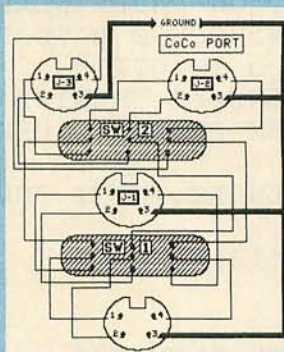
6 A new way to express your imagination.



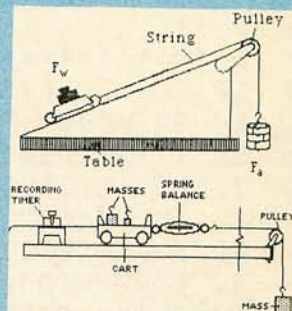
3 Business graphs, charts, diagrams. Also memos



7 Video portrait (with optional digitizer).



9 schematics and floor plans.



4 Junior's homework and science projects. Term papers too!



8 This is a cartoon.



10 Logos and letterheads.

## System Requirements:

Any 64K CoCo and a standard joystick or mouse. (The koala pad and the track ball work, but are not recommended.)

Disk systems need a Multi-Pak or our Y-Cable. CoCo Max is compatible with any Radio Shack DOS and ADOS.

Note: the tape version of CoCo Max includes almost all the features of CoCo Max II except Shrink, Stretch, Rotate, and Glyphics. Also, it has 5 fonts instead of 14.

CoCo Max is not compatible with JDOS, DoubleDOS, MDOS, OS-9, the X-pad, and Daisy Wheel Printers.

## Printers Supported:

Epson MX, RX, FX and LX series, Gemini, Star, Micronix, Delta 10, 10X, 15, 15X, SG-10, Okidata 82A, 92, 93, C. Itoh Pro-writer, Apple Image-writer, Hewlett-Packard Thinkjet, Radio Shack DMP 100, 105, 110, 120, 200, 400, 500, Line Printer 7, Line Printer 8, TRP-100, CGP-220. (DMP-130 use Line Printer 8), PMC printers, Gorilla Banana, Color printing: CGP-200, CGP-115

## Pricing

CoCo Max on tape ..... \$69.95 with Hi-Res Pack and manual.

CoCo Max II (disk only) ..... \$79.95 with Hi-Res Pack and manual.

Upgrade: CoCo Max to CoCo Max II New disk and manual ..... \$19.95

New features of CoCo Max II: 14 fonts and glyphic font, dynamic shrink and stretch, rotate, multiple drive capability, 68 page scrapbook, point and click file load, color printer drivers, full error reporting.

Upgrade: CoCo Max tape to disk manuals, disk and binder ..... \$24.95

Y-Cable: Special Price ..... \$19.95

Super Picture Disks #1, #2, and #3 each: \$14.95

All three picture disks ..... \$29.95

**Guaranteed Satisfaction**  
Use CoCo Max for a full month.  
If you are not delighted with it,  
we will refund every penny.

## Font Editor Option

A font is a set of characters of a particular style. CoCo Max includes 15 fonts. You can create new fonts of letters, or even symbols or graphics with the font editor. Examples: set of symbols for electronics, foreign alphabets, etc. .... \$19.95

## Video Digitizer DS-69

This new Low Cost Digitizer is the next step in sophistication for your CoCo Max system. With the DS-69 you will be able to digitize and bring into CoCo Max a frame from any video source: VCR, tuner, or video camera. Comes complete with detailed manual and C-SEE software on disk. Multi-Pak is required.

New Low Price Save \$50 ..... \$99.95  
New: faster DS-69A ..... \$149.95

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Overseas, FPO, APO add 10%



The listing: MUSPAPER

```

1 *****
2 *      MUSIC SHEET PAPER      *
3 *      FOR THE DMP 105        *
4 *      BY BARRY MCNEICE      *
5 *      YAKIMA, WA            *
6 *****
10 CLS:DIMA(51)
20 PRINT@87,"MUSIC":PRINT@119,"S
HEET":PRINT@151,"PAPER":PRINT@40
7,"BY":PRINT@470,"BARRY":PRINT@5
01,"MCNEICE"
30 FORX=0TO214:READA:NEXTX
40 FORX=0TO50:READB:A(X)=B:NEXTX
50 C=143:FORT=0TO6:C=C+16
60 FORX=0TO50:POKE1023+A(X),C:NE
XTX,T:RESTORE:CLS
70 IFPEEK(65314)/2<>INT(PEEK(653
14)/2) THENPRINT"PRINTER NOT REA
DY!":INPUT"WHEN READY,PRESS(ENTE
R)":PR$
80 IFPEEK(65314)/2<>INT(PEEK(653
14)/2) THEN 70
90 CLS:PRINT"POSITION PAPER NEAR
TOP OF PAGE":PRINT"PRESS p TO P
RINT":PRINT"PRESS q TO QUIT"
100 IN$=INKEY$:IFIN$="" THEN100
110 IF IN$="Q" THEN PRINT#-2,CHR
$(30):END
120 IF IN$="P" THENCLS:INPUT "NU
MBER OF PAGES";P
130 PRINT#-2,CHR$(18)
140 RE=0:PG=0
150 FORR=1TO20
160 READ N:IF N=999 THEN 210
170 IF N>=0 THEN PRINT#-2, CHR$(
128+N);:GOTO 160
180 READM
190 PRINT#-2,CHR$(28);CHR$(-N);C
HR$(128+M);
200 GOTO160
210 PRINT#-2:NEXTR
220 RESTORE:RE=RE+1:IF RE=5 THEN
GOSUB240
230 GOTO 150
240 REP=0:PG=PG+1
250 FOR SP=1TO13:PRINT#-2:NEXTSP
260 IF PG=P THEN PRINT#-2,CHR$(3
0):GOTO70
270 RETURN
280 '***TREBLE CLEF***
290 DATA 999,-12,64,120,124
300 DATA 78,71,67,127,124
310 DATA -255,64,-206,64,999,127
320 DATA -11,64,71,127,96,112,12
0,95,71,-255,64,-205,64,127,999
330 DATA 127,-7,64,96,120,124,94
340 DATA 79,127,67,65,64,64,-254
,64,-207,64
350 DATA 127,999,127,-5,64,124,1
27,71,65
360 DATA 120,124,78,71,127
370 DATA 103,71,78,124,112
380 DATA -255,64,-204,64,127,999
390 DATA 127,-5,64,67,71,76,88
400 DATA 113,115,102,96,96,127,1
12,88,79,71,-255,64,-204,64
410 DATA 127,999,127,-8,0,24,60,
60,56
420 DATA 48,48,24,15,-255,0,-207
,0,127
430 DATA 999,127,-255,0,-223,0,1
27
440 DATA 999,127,-255,0,-223,0,1
27
450 DATA 999,127,-255,0,-223,0,1
27,999
460 '***BASS CLEF***
470 DATA 127,-4,1,65,113,109,71,
3,7,29,121,113,97,-3,1,49,49
480 DATA -255,1,-204,1,127,999,1
27,-4,1,3,7,7,3,-3,1,-4,127,-2,1
490 DATA 13,13,-255,1,-204,1,127
500 DATA 999,127,-5,1,65,65,97,1
13,121,63,31,15,7
510 DATA -255,1,-209,1,127,999
520 DATA 127,-255,1,-223,1,127
530 DATA 999,-255,1,-225,1
540 DATA 999,999,999,999
550 DATA 999,999,999,999
560 '****TITLE SCREEN POKES****
570 DATA 16,17,47,50
580 DATA 79,82,111,113,142,143,1
44
590 DATA 172,173,175
600 DATA 203,207,234,238,239,240
,241,242
610 DATA 266,269,270,272,275,276
620 DATA 298,301,304,308
630 DATA 330,331,334,336,340
640 DATA 364,368,371
650 DATA 397,398,399,400,401,402
660 DATA 433,463,465
670 DATA 495,496,497

```





# Why do more CoCo owners choose 'REAL TALKER'?

*Sure it's priced right, but there's more...*

Thousands of 'Real Talker' owners know 'Real Talker' beats ALL other CoCo voice synthesizers in ease of use and flexibility. And, NO other CoCo talker has a clearer, more intelligible voice. That's quite a lot of advantage when you consider Real Talker's unbeatable price. Yet, Real Talker has some important features that you simply will not find in other CoCo talkers:

**'SAY'** command - You'll have your computer talking brilliantly in just minutes thanks to this powerful new command. Type SAY "ANYTHING YOU WANT" and your words are instantly spoken. It's that simple. Think how easy this makes creating speaking Basic programs. Adding speech to your existing programs is a snap too.

**'CONVERT'** - This is a truly powerful command for the basic programmer. CONVERT automatically transforms a machine language dependent speaking program into a stand-alone Basic program. In other words, you can effortlessly write speaking Basic programs that do not require a machine language translator in memory. This is a unique feature of 'Real Talker'. No other voice synthesizer gives you anything even remotely approaching this type of capability - even synthesizers costing considerably more.

Other features include software controlled pitch, unlimited vocabulary text-to-speech, and even a program that will recite any ASCII file (such as from Telewriter-64 & other word processors). You also get Colorware's unique full-screen phoneme editor program that let's you experiment with and modify speech at it's most fundamental level.

'Real Talker' is compatible with any 16K, 32K, 64K Extended or non-extended Color Computer. It works with any cassette or disk system and comes complete and ready to talk through your T.V. or monitor speaker. Price includes the 'Real Talker' electronic voice synthesizer in a ROM pack, software on cassette (may be transferred to disk), and user manual.



*'Real Talker' is a full-featured electronic voice synthesizer unit built into a compact cartridge case. You simply plug it into the side of your computer.*

## NOW INCLUDED WITH 'REAL TALKER'.....

1. **'DR. TALK'**-This interactive "Eliza" type psychoanalyst program will discuss your innermost problems at length.
2. **'TALKING BATTLESHIP'**-It's you vs. the computer in this speaking version of the classic game.
3. **'TALKING BLACKJACK'**- Play for big stakes against a rather talkative casino dealer.

ONLY  
**\$59.95**

'REAL TALKER-1' (for the original Color Computer).....\$59.95

'REAL TALKER-2' (for the Color Computer-2).....\$64.95

**'Y - BRANCHING CABLE'** For disk systems. If you have a disk system but do not have a Radio Shack Multi-Slot unit, this economical cable will allow to connect and use your Real Talker and Disk system together.....\$27.95

## TALKHEAD

If you have a 'Real Talker', do not deprive yourself of this absolutely incredible machine-language Talking Head simulation program. While other talking head simulations use a minimal cartoon-like face, TALKHEAD uses high resolution, full-screen, digitized images of an actual person's face to create a life-like animated effect.



## SOFTWARE FOR THE 'REAL TALKER'

TALKHEAD can be easily commanded in Basic to appear on screen and say anything you want. Available on cassette or disk for only \$19.95, TALKHEAD requires 64K and a Colorware 'Real Talker'.

ONLY **\$19.95**

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WE ACCEPT VISA, MASTER CARD, M.O.'S, CHECKS.  
N.Y. RESIDENTS MUST ADD SALES TAX.



# Who Will Survive

By Scott Halfman

**Y**ou are traveling in a land far away, seeking fortune. You gain loot by passing from castle to castle, each time picking up all the objects on the different levels (floors) of the castle. After cleaning out each castle, you move on to a new one, and the difficulty of the game increases accordingly.

*Castle* requires 32K Extended Color BASIC, however, it will run in 16K ECB with the disk controller unplugged. Now load in *Castle* and type RUN. The title screen appears. To continue, press the firebutton on the right joystick. The castle door opens and you enter the castle. A skill level prompt appears. Type a number between one and four (1-easy, 4-hard). There is a short pause, and then the computer reveals what objects are to be picked up on that level. Press the firebutton to play.

The game board appears. All the objects are laid on the castle floor, the bonus score and the number of men you have are displayed at the top of the screen. Your man is then lowered onto the game board.

To clear the board, you must pick up all the keys (or other objects) before the bonus countdown runs out, without falling off the path.

When the board is cleared, move to the (white) elevator platform. You are then lifted off that castle level to the next.

After clearing level six, your man makes his way to the castle exit

---

*Scott Halfman is a student at Hendrick Hudson High School in Peekskill, New York, where he has completed a BASIC programming course. His hobbies include skiing, football and the CoCo.*



The background of the page is a photograph of a landscape at sunset or sunrise. The sky is a gradient of orange, yellow, and blue. In the upper left, a dark, bare tree branch reaches across the frame. On the right side, a large, dark silhouette of a castle with multiple towers sits atop a steep cliff. The overall mood is somber and mysterious.

the

Castle

of

Doom?



where you are prompted to either quit or go on. The number of castles finished, your score and the high score are displayed. Press 'Q' to quit or 'C' to continue.

If you dare to continue, your man leaves the castle and a new castle approaches.

(You may direct questions about this program to the author at 15 Lake Road, Peekskill, NY 10566, phone 914-739-4758. Please enclose an SASE when writing.) □

### Main Variables

G	array value for man	SK	current skill level
AS(x)	horizontal location of objects	L	speed of movement of man
BS(x)	vertical location of objects	I	speed of bonus countdown
CR	number of objects left on board	BO	board level of castle (boards completed)
T1, T2, T3	bonus time digits	SC\$	score
GU	number of men left	HS\$	high score
A	horizontal location of man	L1	castle level (castles completed)
B	vertical location of man	L\$	string value of L1

35	.....	106
70	.....	62
1000	.....	89
2030	.....	110
5013	.....	92
6010	.....	166
7020	.....	233
7070	.....	120
7125	.....	245
8010	.....	120
END	.....	179

```

ØE2ØR1ØE1ØL25G1ØR5G3ØBM154,115E1
5L1ØE15R1ØG5R35E5R1ØG2ØF15G1ØL1Ø
E1ØH15L2ØG1ØL15"
4Ø DRAW"BM18Ø,115R1ØG5R1ØG5L2ØE1
ØBM189,14ØR1ØG5R5G1ØL15E15":PAIN
T(38,22),3,3:DRAW"BM199,6ØC4R5U6
ØD6ØG5L5U65D65E5":PAINT(2Ø1,61),
4,4:LINE(19Ø,3)-(21Ø,9),PRESET,B
F:RETURN
45 CR$(1)="C2R3D3L4U3R9D2L2U2":C
R$(2)="C2U4R4D6L4U4R3D4L1U6R2D2C

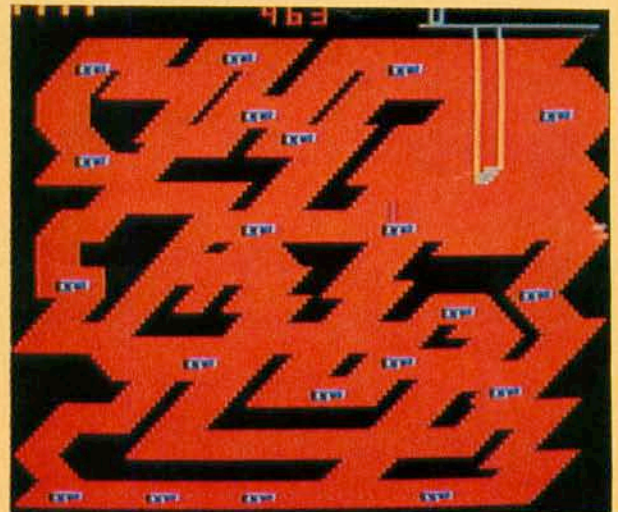
```

### The listing: CASTLE

```

1Ø CLEAR13Ø:POKE65495,Ø:DIMG(3,1
),AS(21),BS(21):GOSUB8ØØØ:GOSUB7
14Ø:Pmode3,1
15 BO=Ø:T1=9:T2=9:T3=9:GU=4:A=2Ø
Ø:RESTORE:PLAY"ABCDEFGH":CLS:PRIN
TØ6,,:INPUT"SKILL LEVEL(1-4)":SK
:I=SK*.2:IFSK<1ØRSK>4THEN15 ELSE
L=17-SK*3.5:GOTO45
2Ø Pmode3,1:PCLS:DRAW"BM14,185C3
R2Ø5E2ØL2ØE2ØL2ØE3ØL1ØH1ØE2ØH1ØE
1ØH1ØE1ØU1ØH1ØL1ØE1ØL1ØØG2ØL1ØE2
ØL4ØG1ØL1ØE1ØL4ØG2ØD1ØF1ØG1ØR3ØG
1ØL1ØG1ØD2ØR1ØG2ØR3ØF1ØR1ØG1ØL2Ø
G2ØF1ØG1ØR1ØBM55,12ØR4ØE1ØL1ØE1Ø
L1ØG1ØL1ØE1ØL1ØG2Ø"
25 DRAW"BM34,175R1ØØE1ØL9ØE3ØL1Ø
G2ØL2ØG1ØF1ØBM154,175E1ØR3ØE1ØR1
ØG15R1ØG5L5ØBM84,155R7ØE2ØL1ØG1Ø
L5ØE2ØL1ØG3ØBM134,135R1ØE1ØL1ØG1
Ø"
3Ø DRAW"BM34,115R1ØE4ØL3ØG1ØL1ØD
1ØR1ØD1ØG1ØBM64,65R4ØG1ØR1ØE2ØL2
ØE1ØL1ØG1ØL2ØG1ØBM84,45E2ØL5G2ØR
5BM69,35L1ØL15E1ØL5G1ØD1ØF1ØR1ØE
5L5E15L5"
35 DRAW"BM89,85G5R1ØE5L1ØBM147,2
5R5G2ØL5E2ØBM114,85R4ØG2ØR1ØG1ØL
15E1ØL1ØE1ØL5H1ØBM124,75R2ØE1ØL1

```



```

3U1":CR$(3)="C3R3U2C2R2U1D1R1D2R
1L1D1L2D1U1L1U2L1R1U1":CR$(4)="C
3R2U2C2D2F2E2U2L2D6R2L4":CR$(5)=
"C3R2U2C2R6L2D4R2L6R2U4R2D4":CR$
(6)="C3R2U4C2F4G4H4E4D2R2L4R2D1L
2R4L2D1R4L8R4D2L2R4L2"
5Ø DATA 36,96,162,224,36,1Ø4,12Ø
,1Ø4,8Ø,28,24,64,176,1Ø4,16Ø,2Ø4
,216,184,132,16Ø
55 DATA 24,2Ø,24,4Ø,56,4Ø,48,8Ø,
128,1ØØ,18Ø,18Ø,18Ø,18Ø,128,14Ø,
1Ø4,11Ø,14Ø,8Ø
6Ø FORX=1TO2Ø:READAS(X):NEXTX:FO
RX=1TO2Ø:READBS(X):NEXTX

```



# OS9 + X = POWER

## XTERM

OS-9 Communications program.

- Menu oriented
- Upload/download. Ascii or XMODEM protocol
- Execute OS-9 commands from within XTERM
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- Works with standard text screen, XSCREEN, WORDPAK, or O-PAK
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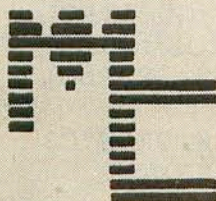
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```

70 PR$(1)="PICK UP ALL KEYS":PR$(2)="LOCK ALL DOORS":PR$(3)="PICK UP ALL RINGS":PR$(4)="PICK UP ALL CUPS":PR$(5)="PICK UP ALL SCROLLS":PR$(6)="PICK UP ALL DIAMONDS"
80 N$(1)="C1R2C3G2E2D6R2L4":N$(2)="R4D3L4D3R4":N$(3)="R4D3L3R3D3L4":N$(4)="D3R4U3D6":N$(5)="R4L4D3R4D3L4":N$(6)="D6R4U3L4":N$(7)="R4D2G4":N$(8)="R4D3L4U3D6R4U3":N$(9)="D3R4U3L4R4D6":N$(10)="R4D6L4U6":GOSUB5010
100 PLAY":A=A+(JOYSTK(0)-32)/L:B=B+(JOYSTK(1)-32)/L:PUT(A-1,B-3)-(A+1,B+3),G,NOT
105 T3=T3-I:ON T3+2 GOSUB200:LINE(130,3)-(134,9),PRESET,BF:DRAW"BM130,3"+N$(T3)
110 PUT(A-1,B-3)-(A+1,B+3),G,NOT:ONPOINT(A,B+3)GOTO1000,2000,1000,3000
200 T3=9:T2=T2-1:ONT2+2GOTO210:LINE(120,3)-(124,9),PRESET,BF:DRAW"BM120,3"+N$(T2):RETURN
210 T2=9:T1=T1-1:LINE(110,3)-(124,9),PRESET,BF:ONT1+2GOTO220:DRAW"C3BM110,3"+N$(T1)+"BM120,3"+N$(T2):RETURN
220 T1=5:T2=9:T3=9:FORX=1TO3:PLAY"L100;1;2;3;4;5;6;7;8;9;10;11;12":NEXTX:PUT(A-1,B-3)-(A+1,B+3),G,NOT:GOTO1000
1000 IN=3:FORX=B TO191STEP2:X=X+IN:PUT(A-1,X-3)-(A+1,X+3),G,NOT:IN=IN+.1
1010 PLAY"AV"+STR$(INT(31-(X/8))):PUT(A-1,X-3)-(A+1,X+3),G,NOT:NEXT:ONGU GOTO 6000:GU=GU-1:PUT(GU*10-1,3)-(GU*10+1,6),G,NOT

```

```

1020 B=10:PLAY"V31":IN=0:FORA=2TO199STEP2:IFA>139THENB=B+1
1025 PUT(A-1,B-3)-(A+1,B+3),G,NOT:PLAYSTR$(INT(B/4)):PUT(A-1,B-3)-(A+1,B+3),G,NOT:NEXTA
1030 PUT(A-1,B-3)-(A+1,B+3),G,NOT:PLAY"O3V15L255":FORX=1TO10:PLAYSTR$(RND(12)):PAINT(A,B),1,3:PAINT(A,B),4,3:PAINT(A,B),2,3:NEXTX:PAINT(A,B),3,3
1040 DRAW"BM110,3"+N$(T1)+"BM120,3"+N$(T2)+"BM130,3"+N$(T3):GOTO1000
2000 CR=CR-1:PAINT(A,B+3),3,3:GOTO2010
2005 Y=LEN(SC$):FORX=2 TO Y:LINE(156+10*X,3)-(166+10*X,9),PRESET,BF:DRAW"BM"+STR$(156+10*X)+",3"+N$(VAL(MID$(SC$,X,1))):NEXTX:RETURN
2010 PLAY"L255ABC":SC$=STR$(VAL(SC$)+10):GOSUB2005:ONCR GOTO2030
2020 GOTO 1000
2030 PUT(A-1,B-3)-(A+1,B+3),G,NOT:FORV=1TO30STEP6:PLAY"V"+STR$(V):FORN=1TO12:PLAYSTR$(N):NEXTN,V:PUT(A-1,B-3)-(A+1,B+3),G,NOT:GOTO1000
3000 IFPOINT(A-1,B+3)=3ORPOINT(A+1,B+3)=3THENGOTO1000ELSEB=63:PLAY"CDEFGAB":X=B'ELEVATOR ROUTINE
3010 A=200:FORE1=1TO5:PLAY"O"+STR$(E1):FORE2=1TO12:X=X-1:PUT(A-1,X-3)-(A+1,X+3),G,NOT:PLAYSTR$(E2):PUT(A-1,X-3)-(A+1,X+3),G,NOT:NEXTE2,E1
3015 IF CR>1THENGOSUB5030
3020 PLAY"O3":ON CR GOSUB5000:GOTO1000
5000 IFBO=6THENBO=0:GOSUB7000'draw board routine
5005 SC$=STR$(VAL(SC$)+T1*100+T2*10+T1):GOSUB2005:T1=1:T2=1:T3=1:DRAW"C3":GOSUB200:LINE(110,3)-(134,9),PRESET,BF:FORX=1TO30:PUT(172,3)-(166+LEN(SC$)*10,9),G,NOT:PLAY"O1A":NEXTX
5010 T1=9:T2=9:T3=9:PCLS:DRAW"BM110,3"+N$(9)+"BM120,3"+N$(9)+"BM130,3"+N$(9):BO=BO+1:GU=GU+1:PCLS:CLS:PRINT@268,"PHASE";BO:PRINT@288+(32-LEN(PR$(BO)))/2,PR$(BO):GOSUB200:IFGU>5THENGU=5
5013 FORX=110TO130STEP10:DRAW"C3BM"+STR$(X)+",3"+N$(9):NEXTX

```

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```

5015 DRAW"C4":LINE(172,2)-(245,2
),PSET:LINE(172,10)-(245,10),PSE
T:GOSUB2005:PLAY"01ABCDEFGF"
5020 PRINT@484,"PRESS FIRE BUTTO
N TO PLAY";IFPEEK(65280)=126 OR
PEEK(65280)=254 THENSCREEN1,0:PO
KE65314,248:CR=21 ELSE GOTO5020
5025 FORX=1TO20:PLAY"01CDEF":DRA
W"BM"+A$(X)+","+"B$(X)+CR$(BO):NE
XTX:FORX=10TOGU*10-10STEP10:PUT(
GU*10-1-X,3)-(GU*10-X+1,6),G,NOT
:PLAY"03CDEFG":NEXTX:X=3
5030 FORE1=5TO1STEP-1:PLAY"O"+ST
R$(E1):FORE2=12TO1STEP-1:X=X+1:P
UT(A-1,X-3)-(A+1,X+3),G,NOT:PLAY
STR$(E2):PUT(A-1,X-3)-(A+1,X+3),
G,NOT:NEXTE2,E1=B=X
5040 PLAY"03L255V15":FORA=199TO2
10:PUT(A-1,X-3)-(A+1,X+3),G,NOT:
PLAY"12":PUT(A-1,X-3)-(A+1,X+3),
G,NOT:NEXTA:DRAW"C3":RETURN
5500 '?score and all that stuff
5510 GOTO 5510
6000 LINE(90,88)-(178,120),PRESE
T,BF
6010 DRAW"BM100,90C4R4L4D6R4U3L2
BM109,90;D6U3R4U3L4R4D6BM116,90;

```

```

D6U6R3D3U3R3D6BM127,90R4L4D3R2L2
D3R4BM140,90R4D6L4U6BM149,90;D4F
2E2U4BM157,90R4L4D3R2L2D3R4BM165
,90;D6U6R2F2G2L2R2F2"
6020 DRAW"BM97,100D6U3R4U3D6BM10
4,100R4L2D6L2R4BM113,100R4L4D6R4
U3L2BM120,100D6U3R4U3D6BM137,100
R4L4D3R4D3L4BM144,100R4L4D6R4BM1
53,100R4D6L4U6BM160,100D6U6R2F2G
2L2R2F2BM169,100R4L4D3R2L2D3R4"
6030 IF VAL(SC$)>VAL(HS$)THEN HS
$=SC$:PLAY"V31CDEFGABBAGFEDCCCCC
V15"
6040 Y=LEN(HS$)*10:DE=117-Y/2:LI
NE(127-Y/2,108)-(127+Y/2,118),PR
ESET,BF:FORX=2TOY/10:DRAW"C3BM"+
STR$(DE+X*10)+","+"N$(VAL(MID
$(HS$,X,1))):NEXTX
6050 POKE178,RND(255):LINE(90,88
)-(178,120),PSET,B:IFPEEK(65280)
=126ORPEEK(65280)=254THEN6060 EL
SE 6050
6060 GOTO 15
7000 CLS'intermission
7010 PCLS:DRAW"C3BM190,45F10L30G
100F5R100H10R40F30L40H10L130H15E
15R10E100R20F10":PAINT(185,45),3

```



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```

,3: DRAW"C4BM190,160R6F6L6H6BM190
,175D16U16F6D10U10R6D10BM175,45U
45D45R6F6U51D51L6U51D51H6"
7015 L1=L1+1:L$=STR$(L1):IF L1>9
9THEN L1=1 ELSE IF L1<10THENL$="
"+L$
7020 DRAW"C4S40BM10,10"+N$(VAL(M
ID$(L$,2,1))+"BM60,10"+N$(VAL(M
ID$(L$,3,1))+"S4":LINE(150,2)-(
245,2),PSET:LINE(150,10)-(245,10
),PSET:LINE(150,3)-(245,9),PRESE
T,BF:GOSUB2005
7025 SCREEN1,1:POKE65314,248:O=5
:P=8:FORX=5TO43:PUT(180,X-3)-(18
2,X+3),G,NOT:P=P-1:IF P=0 THEN P
=8:O=O-1
7026 PLAY"L255O"+STR$(O)+"":+STR
$(P):PUT(180,X-3)-(182,X+3),G,NO
T:NEXTX
7030 PRINT"YOUR SCORE ";SC$:PRIN
T:PRINT"HIGH SCORE ";HS$:PRINT:P
RINT"YOU HAVE COMPLETED LEVEL";L
1:PRINT:PRINT"PRESS <<C>> TO CON
TINUE":PRINT"PRESS <<Q>> TO QUIT
"
7040 A$=INKEY$:IFA$="Q"THENSCEE
N1,0:POKE65314,248:GOTO6000
7045 PLAY"L255O"+STR$(RND(5))+"";
"+STR$(RND(12))+"O3"
7050 IF A$<>"C"THEN7040
7060 SCREEN1,0:POKE65314,248:Y=4
5:FORX=181 TO 55STEP-1:PUT(X-1,Y
-3)-(X+1,Y+3),G,NOT:PLAY"A":PUT(
X-1,Y-3)-(X+1,Y+3),G,NOT:IFX<160
THENY=Y+1
7070 NEXTX:FORY=Y TO Y+10:PUT(X-
1,Y-3)-(X+1,Y+3),G,NOT:PLAY"A":P
UT(X-1,Y-3)-(X+1,Y+3),G,NOT:NEXT
Y
7080 FORX=55 TO195:PUT(X-1,Y-3)-
(X+1,Y+3),G,NOT:PLAY"AA":PUT(X-1
,Y-3)-(X+1,Y+3),G,NOT:NEXTX:FOR
Y=Y TO191:PUT(X-1,Y-3)-(X+1,Y+3)
,G,NOT:PLAY"A":PUT(X-1,Y-3)-(X+1
,Y+3),G,NOT:NEXTY
7090 PMODE0,2:PCLS:PMODE0,1:PCLS
:SCREEN1,1:Y1=40:Y2=151:X1=0:X=1
60:UX=0:SCREEN1,1:IN=-3:DE=1:GOT
O7115
7100 X=X+IN:PLAY"O3V31L255B":PMO
DE0,2:PCLS:LINE(97,191)-(97-X/2,
200+X),PSET:LINE-(157+X/2,200+X*.8
),PSET,B:LINE-(157,200),PSET:LINE
-(97,200+X*.8),PSET,B:LINE(97,200)
-(97-X/2,200+X*.8),PSET:LINE(157,
191)-(157+X/2,200+X),PSET
7110 PCOPY2TO1:PMODE0,1:SCREEN1,
1:IFX=DE THEN 7111 ELSEGOTO7100
7111 FORX=31TO1STEP-1:PLAY"O1AV"

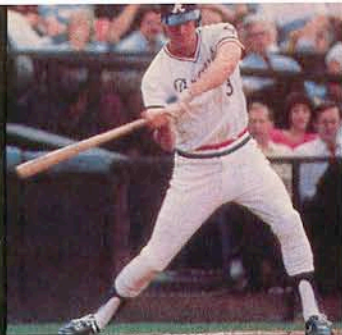
```

```

+STR$(X):NEXTX:RETURN
7115 GOSUB7100
7120 IG=0:B=0:IN=0:PCLS:FORX=1TO
94:IG=IG+1:PMODE0,2:PCLS:B=B+3+I
N:IFB>120THENIN=IN-.4ELSEIN=IN+.
2
7125 IF IG>47THENIN=IN+.2
7130 LINE(B-X/3,B-X)-(B+X/3,B+X)
,PSET,B:PCOPY2TO1:PMODE0,1:SCREE
N1,1:NEXTX
7140 PMODE0,2:PCLS:SCREEN1,1:X=0
:IN=3:DE=192:GOSUB7100
7150 FORX=1TO20STEP2:PMODE0,2:PC
LS:LINE(97-X,200-X)-(157+X,181+X/
5),PSET,B:LINE(0,181+X/5)-(255,1
81+X/5),PSET:LINE(0,181)-(97-X,2
00-X),PSET:LINE(157+X,200-X)-(255,
181),PSET
7160 PCOPY2TO1:PMODE0,1:SCREEN1,
1:NEXTX
7170 FORX=1TO76STEP4:PMODE0,2:PC
LS:LINE(177+X,181+X/2)-(76-X,0)
,PSET,B:LINE-(0,181+X/2),PSET:LI
NE(177+X,0)-(255,181+X/2),PSET:L
INE(0,181+X/2)-(255,181+X/2),PSE
T
7180 PCOPY2TO1:PMODE0,1:SCREEN1,
1:NEXTX
7190 PLAY"O3ACDDDEFAABV15":RETUR
N
8000 PMODE3,1:POKE179,53:PCLS:SC
REEN1,1:POKE65314,248:POKE179,3:
PAINT(0,191),1,4
8010 DRAW"BM36,70R32L32G30R32E5L
22E15R22E10R1C1R5;C4G30R6E20R10G
20R6E30L20R7G1C1G2C4R5G5L5E6C1E2
C4R15C1R5;C4R32G10L22G6R22G14L32
E6R22E4L22E20R33C1R3;C4R32G10L12
G20L6E20L12E10R32C1R7;C4R6G10L2G
14R24G6L32E30R10C1R28"
8020 DRAW"C4R32G10L22G5R22G5L22G
5R22G5L32E30BM96,105R6G6L6E6R7C1
R3C4R6L6G3R3L3G3E6R7C1R12;C4R4D3
G3L9E6R5C1R8;C4R6G6L6E6R7C1R3;C4
R6G6L6E6R7C1R4;C4G6E6R3G3E3R4G6"
8030 FORX=50TO230STEP32:PAINT(X,
75),3,4:NEXTX:PAINT(70,75),3,4
8035 POKE65494,0:PLAY"V1501L9CP3
0CP3CP30CP3":PLAY"L2CL9DP2L2CL9D
P2L2CL4DL3E-L2CL20":FORX=15TO1ST
EP-1:PLAY"GL30G-V"+STR$(X)+"L20"
:NEXTX:POKE65495,0
8040 FORX=1TO255:POKE178,X:LINE(
3,65)-(250,120),PSET,B
8050 IFPEEK(65280)=127ORPEEK(652
80)=255THENNEXTX:GOTO8040ELSELIN
E(5,65)-(250,120),PRESET,B:POKE1
78,53:PAINT(0,0),,2:POKE178,3:RE
TURN

```





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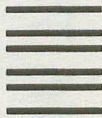
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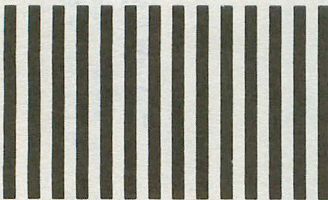
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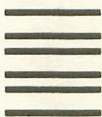
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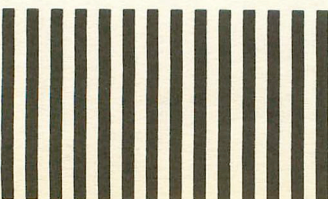
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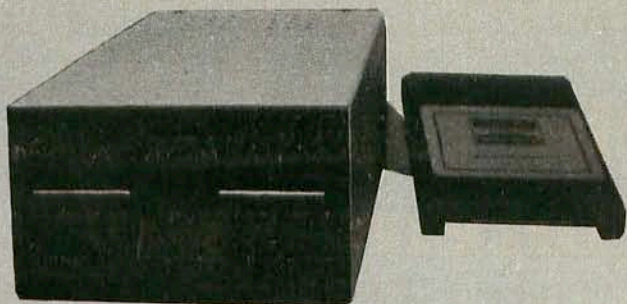
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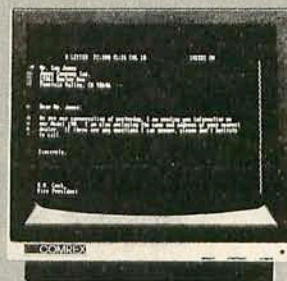






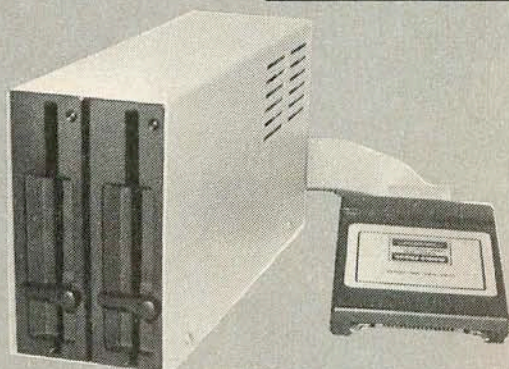
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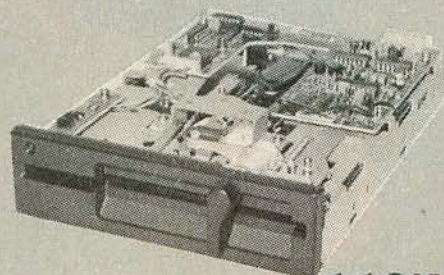
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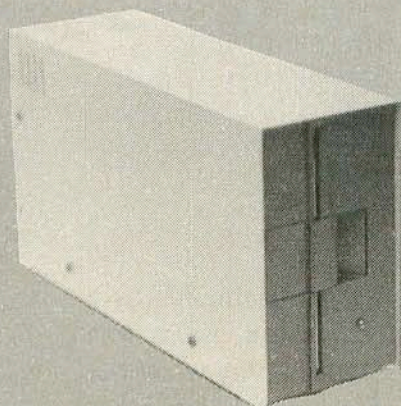
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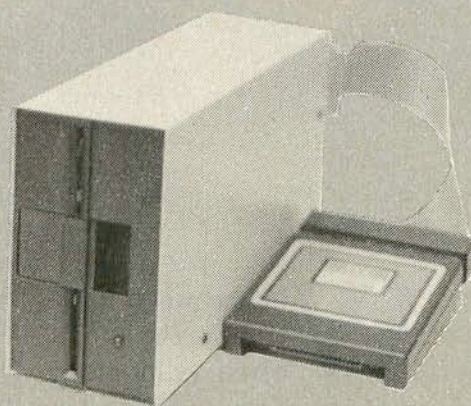
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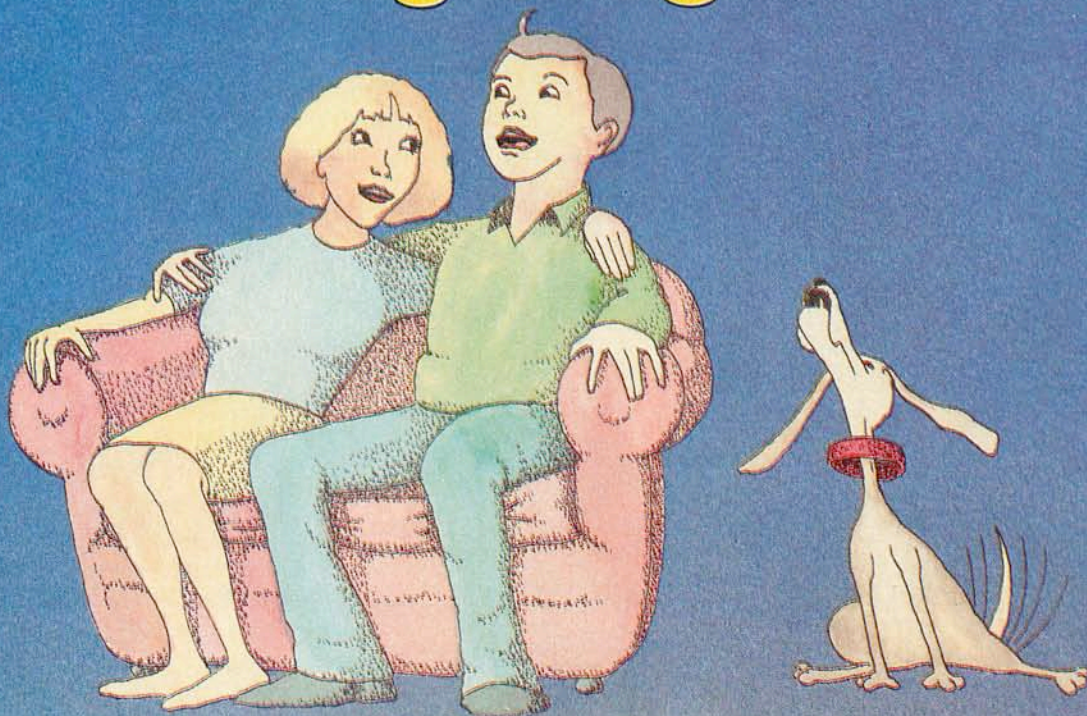
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Allow an additional 2 weeks for personal checks—Drive faceplates may vary slightly

Prices subject to change without notice.



# Saturday at the Bijou — Remembering Intermission Sing-alongs



**By Ruth E. Golias**

**W**hen I was a little girl, a cherished amusement was a trip to the movies. During intermission, there was often a sing-along. The organist would play while the words to the song flashed on the screen. Everyone joined in as the master of ceremonies led the singing.

With *Sing-Along* I have tried to evoke that long-ago era when the audience was so much a part of the entertainment. I used the PRINT @ statements rather than graphics because I find them very interesting. Enjoy!

(Questions about this program may be directed to the author at 2826 Pacific Coast Highway, Torrance, CA 90505, phone 213-325-1384. Please enclose an SASE when writing.) ☐

*Ruth Golias has retired from the Torrance Police Department where she did microfilming. She is learning to program her CoCo and it has become her hobby.*



120 .....136	720 .....40
230 .....137	840 .....46
330 .....47	930 .....56
440 .....60	1050 .....218
530 .....150	1140 .....205
630 .....248	END .....206

#### The listing: SINGLONG

```

10 'SING-ALONG-BY RUTH E. GOLIAS
2 '----TORRANCE, CALIFORNIA----
30 CLS4:FORB=32TO448STEP21:PRINT
@B,"SING-ALONG";:NEXT:SCREEN0,1
40 GOSUB1220
50 CLS6:PRINT@136,"NOW, LET'S B
EGIN,";:PRINT@295,"SING ALONG WI
TH ME.":;SCREEN0,1
60 GOSUB1220
70 CLS:PRINT@134,"I DON'T WANT T
O PLAY";:PRINT@170,"IN YOUR YARD
";:PRINT@236,"*****";:PRINT@2
92,"WORDS BY PHILIP WINGATE";:PR
INT@326,"MUSIC BY H.W.PETRIE";:P
RINT@365,"1894";:SCREEN0,1
80 GOSUB1220
90 CLS3:FORB=35 TO 450STEP20:PRI
NT@B,"I"CHR$(175)"DON'T";:NEXT:S
CREEN0,1:PLAY"O2L8FA"
100 CLS3:FORB=34 TO 450STEP21:PR
INT@B,"WANT"CHR$(175)"TO";:NEXT:
SCREEN0,1:PLAY"O3CO2A"
110 CLS3:FORB=34 TO 450STEP21:PR

```

```

INT@B,"PLAY"CHR$(175)"IN";:NEXT:
SCREEN0,1:PLAY"FD"
120 CLS3:FORB=33 TO 450STEP21:PR
INT@B,"YOUR"CHR$(175)"YARD";:NEX
T:SCREEN0,1:PLAY"L4EL4.E"
130 GOSUB1220
140 GOSUB1240
150 PRINT@230,"I DON'T WANT TO P
LAY                IN YOUR YARD,
":PLAY"T2L8FAO3CO2AFDL4.EEP4"
160 PRINT@224,"                I DON'T L
IKE YOU                ANY M
ORE,";:PLAY"L8GB-O3L8DO2B-GEO3L2.
C"
170 PRINT@224,"                YOU'LL BE S
ORRY WHEN                YOU SEE
ME,";:PLAY"O2L8FAO3CO2AFDL4.EE"
180 PRINT@224,"                SLIDING D
OWN OUR                CELLAR
DOOR,";:PLAY"L8AGBAFDL2.G"
190 PRINT@230,"YOU CAN'T HOLLER
DOWN                OUR RAIN BARRE
L,";:PLAY"L8FAO3CO2AFDL4.EEP4"
200 PRINT@224,"                YOU CAN'T
CLIMB                OUR APPLE
TREE,";:PLAY"L8GB-O3DO2B-GEO3L2.
CL4C#"
210 PRINT@230,"I DON'T WANT TO P
LAY                IN YOUR YARD"
:PLAY"L8DE-DO2DF#AO3L4.CO2B-P4"
220 PRINT@230," IF YOU WON'T BE
GOOD TO ME.":
SCREEN0,1:PLAY"L8AGB-GL8..ECL4L2
..F"

```

#### One-Liner Contest Winner . . .

Here's one to frighten even the toughest of you. Type it in and RUN it. You might even want to bring it back out for Halloween.

#### The listing:

```

10 PMODE 2,1:SCREEN 1,1:PCLS(1):
PMODE4,1:SCREEN1,1:PCLS:N=RND(4)
:FOR T=1 TO N:Z=RND(11):X=RND(23
0):Y=RND(100):LINE(X,0)-(X+10,Y)
,PSET:LINE-(X,Y+Z),PSET:LINE-(X+
20,Y+80),PSET:NEXT T:PCLS:FOR W=
1 TO X*9:NEXT W:GOTO 10

```

John Collicott  
Inman, Kansas

(For this winning one-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape*.)

#### One-Liner Contest Winner . . .

Try using this program to encode secret messages to your friends. You might try to use this routine in a larger program that would encode and decode the messages for you.

#### The listing:

```

10 INPUT"MESSAGE";M$:INPUT"SHIFT
(1-25)";S:PRINT:FORN=1TOLEN(M$):
P$=MID$(M$,N,1):IF ASC(P$)<65 OR
ASC(P$)>90 THEN PRINTP$;:NEXTN
ELSE K=ASC(P$)+S:IF K>90 THEN K=
K-26:PRINTCHR$(K);:NEXTN ELSE PR
INTCHR$(K);:NEXTN:PRINT

```

Richard Delval  
Cardiff, California

(For this winning one-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape*.)



```

230 GOSUB1220
240 CLS:PRINT@134,"MEET ME IN ST
. LOUIS":PRINT@226,"WORDS BY AND
REW B. STERLING":PRINT@262,"MUSI
C BY KERRY MILLS":PRINT@333,"190
4":SCREEN0,1
250 GOSUB1220
260 CLS6:FOR B=35 TO 450STEP20:P
RINT@B,"MEET"CHR$(223)"ME";:NEXT
:SCREEN0,1:PLAY"T4O2L2CL4D"
270 CLS6:FORB=33 TO 448 STEP51:P
RINT@B,"IN"CHR$(223)"ST."CHR$(22
3)"LOUIS";:NEXT:SCREEN0,1:PLAY"T
4L2EL4FL2GO3L4E"
280 CLS6:FOR B=32 TO 448 STEP45:
PRINT@B,"LOUIS";:NEXT:SCREEN0,1:
PLAY"CO2L4G"
290 GOSUB1220
300 GOSUB1240
310 PRINT@228,"MEET ME IN ST.LOU
IS, LOUIS, MEET ME AT THE
FAIR.":PLAY"T4O2L2CL4DL2EL4FL2G
O3L4EL4CO2L2GL2AO3L4CO2L2BL4AL2.
GL2GP4"
320 PRINT@227,"DON'T TELL ME THE
LIGHTS ARE SHINING ANY PLACE
BUT THERE.":PLAY"T4O2L2CL4DL2EL

```

```

4FL2GO3L4EL4CO2L2GO2L2AO3L4DL2DL
4EL2.DL4D"
330 PRINT@224," WE WILL D
ANCE THE 'HOOCH-EE
KOOCH-IE,'"':PLAY"L4DL4D#L2EL4DL2
CL4O2BO3L4EO2L2AL4A"
340 PRINT@224," I WILL B
E YOUR TOOTSIE W
OOTISIE.":PLAY"L4G#L4AO3L2DL4CO2L
2BL4AO3L4DO2L2GL4GL4EL4D"
350 PRINT@224," MEET ME IN ST.
LOUIS, LOUIS, MEET ME AT
THE FAIR.":SCREEN0,1:PLAY"T4O2L2
CL4DL2EL4FL2GO3L4EL4.CO2L2.GL2AO
3L4CO3L2DO2L4GO3L2.CL2C
360 GOSUB1220
370 CLS:PRINT@164,"A BICYCLE BUI
LT FOR TWO":PRINT@206,"BY":PRINT
@234,"HARRY DACRE":SCREEN0,1
380 GOSUB1220
390 CLS7:FORB=33 TO 448 STEP21:P
RINT@B,"A"CHR$(239)"BICYCLE";:NE
XT:SCREEN0,1:PLAY"O2L4B-O3L2CAF"
400 CLS7:FORB=33 TO 448 STEP21:P
RINT@B,"BUILT"CHR$(239)"FOR";:NE
XT:SCREEN0,1:PLAY"L2GL4C"
410 CLS7:FORB=34 TO 450 STEP49:P

```

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```

RINT@B,"TWO";:NEXT:SCREENØ,1:PLA
Y"L2..F"
42Ø GOSUB122Ø
43Ø GOSUB124Ø
44Ø PRINT@233,"DAISY, DAISY,
      GIVE ME YOUR ANSWER, D
O":PLAY"T5O3L2.CO2AFCL4DEFL2DL4F
L2...C"
45Ø PRINT@233,"I'M HALF CRAZY,
      ALL FOR THE LOVE OF Y
OU!":PLAY"L2.GO3L2.CO2L2.AFL4DEF
L2GL4AL2...G"
46Ø PRINT@225,"IT WON'T BE A STY
LISH MARRIAGE. I CAN'T AFFORD
A CARRIAGE.":PLAY"L4AB-AGO3L2CO
2L4AGL2...FL4GL2AL4FL2DL4FDL2...
C"
47Ø PRINT@224,"      BUT YOU'LL
LOOK SWEET,      ON THE
SEAT,":PLAY"L4CL2FL4AL4...GP8P8
L2FL4AGP4P8"
48Ø PRINT@224,"      OF A BICYC
LE BUILT,      OF A BICYC
LE BUILT,":PLAY"L8AB-O3L4CO2AFGP
4P8L8AB-O3L4CO2AFGP4P8"
49Ø PRINT@224,"      OF A BICYCLE B
UILT FOR TWO!":SCREENØ,1:PLAY"L8
AB-O3L4CO2AFL2GL4CL2..FL4F"
50Ø GOSUB122Ø
51Ø CLS:PRINT@168,"AFTER THE BAL
L":PRINT@2Ø6,"BY":PRINT@231,"CHA
RLES K. HARRIS":SCREENØ,1
52Ø GOSUB122Ø
53Ø CLS6:FORB=33 TO 479 STEP 48:
PRINT@B,"AFTER"CHR$(223)"THE"CHR
$(223)"BALL";:NEXT:SCREENØ,1:PLA
Y"T4O2L2.ABL4GO3L2.CC"
54Ø GOSUB122Ø
55Ø GOSUB124Ø
56Ø PRINT@228,"AFTER THE BALL IS
OVER,      AFTER THE BREAK O
F DAWN.":PLAY"T4O3L4EGEL2CO2L4AO
3L2.CO2L2.GO3L4EGEL2CO2L4AL2...B
"
57Ø PRINT@227,"AFTER THE DANCER'
S LEAVING,      AFTER THE STARS A
RE GONE.":PLAY"O3L4FAFL2EL4DL2.C
#DL4DEDO2L2BL4GO3L2..G"
58Ø PRINT@224,"      MANY A HEART
IS ACHING;      IF YOU COULD R
EAD THEM ALL,":PLAY"L4EGEL2CO2L4
AO3L2.CO2L2.GL4AO3C#EL2AL4GL2...
F
59Ø PRINT@224,"      MANY THE
HOPES      THAT HAVE
VANISHED":PLAY"L4GDDDEFL2.EO2G"
60Ø PRINT@224,"":PRINT@255,"
      AFTER THE BALL.":SCREENØ,1:

```

```

PLAY"ABL4GO3L2...C"
61Ø GOSUB122Ø
62Ø CLS:PRINT@133,"IN MY MERRY O
LDSMOBILE":PRINT@2Ø4,"*****":
PRINT@261,"WORDS BY VINCENT BRYA
N":PRINT@294,"MUSIC BY GUS EDWAR
DS":SCREENØ,1
63Ø GOSUB122Ø
64Ø CLS1:FORB=32 TO 448 STEP21:P
RINT@B,"IN"CHR$(143)"MY"CHR$(143
)"MERRY";:NEXT:SCREENØ,1:PLAY"T4
O3L4CO2BL2AL4E"
65Ø CLS1:FORB=33 TO 448 STEP21:P
RINT@B,"OLDSMOBILE";:NEXT:SCREEN
Ø,1:PLAY"L2AL4EL2.AL4A"
66Ø GOSUB122Ø
67Ø GOSUB 124Ø
68Ø PRINT@228,"COME AWAY WITH ME
LUCILLE,      IN MY MERRY OLD
SMOBILE,":PLAY"T5L2O3DL4CO2L2BL4
DL2BL4DL2.BL4BO3CO2L4BL2AL4EL2AL
4EL2.AL4A"
69Ø PRINT@224,"DOWN THE ROAD OF
LIFE WE'LL FLY      AUTOMOBUBLING
YOU AND I.":PLAY"L4AGL2F#O3L4DL
2DL4DL2.DO2L4DEF#GO3L2DDL4DL2.D"
70Ø PRINT@224,"      TO THE
CHURCH      WE'LL SWIF
TLY STEAL,":PLAY"L2DL4CO2L2BL4DL
2BL4DL2.BL4B"
71Ø PRINT@224,"      THEN OUR WE
DDING BELLS      WILL
PEAL,":PLAY"O3CO2BL2AL4EL2AL4EL2
.AL4A"
72Ø PRINT@23Ø,"      YOU CAN GO AS F
AR,      AS YOU LIKE WITH
ME":PLAY"AGL2F#O3L4DDC#DL2EL4DO
2L4B"
73Ø PRINT@224,"":PRINT@256,"
      IN MY MERRY OLDSMOBILE.":SCRE
ENØ,1:PLAY"AGL2AL4G#L2AL4BL2.GO3
L2G"
74Ø GOSUB122Ø
75Ø CLS:PRINT@194,"GIVE MY REGAR
DS TO BROADWAY":PRINT@265,"BY":P
RINT@334,"GEORGE M. COHAN":SCREE
NO,1
76Ø GOSUB122Ø
77Ø CLS7:FORB=34 TO 448 STEP21:P
RINT@B,"GIVE"CHR$(239)"MY";:NEXT
:SCREENØ,1:PLAY"L4CL2D"
78Ø CLS7:FORB=33 TO 448 STEP21:P
RINT@B,"REGARDS"CHR$(239)"TO";:N
EXT:SCREENØ,1:PLAY"L4EL2FG"
79Ø CLS7:FORB=34 TO 448 STEP21:P
RINT@B,"BROADWAY";:NEXT:SCREENØ,
1:PLAY"L1FL2.E"
80Ø GOSUB122Ø
81Ø GOSUB124Ø

```



```

820 PRINT@224," GIVE MY REGARDS
TO BROADWAY, REMEMBER ME TO
HERALD SQUARE.":PLAY"T4O2L4CL2DL
4EL2FGL1FL2.EL4CDDDDL2EEL1C"
830 PRINT@224," TELL ALL T
HE GANG, AT FORTY SEC
OND STREET":PLAY"L4CL2DL4EL2FDEF
L4GED"
840 PRINT@224,"
THAT I WILL SO
ON BE THERE.":PLAY"CL2FDEFLLGL2.
G"
850 PRINT@224," WHISPER
OF HOW, I'M YEA
RNING":PLAY"L4CL2DL4EL2FGL1FL2.E
"
860 PRINT@224," TO MINGL
E WITH THE OLD TIM
E THROG.":PLAY"L4CDDDDL2EEL1CC"
870 PRINT@224," GIVE MY
REGARDS TO OLD B
ROADWAY":PLAY"L4AL2F#L4DL2B-AGF#
L4G"
880 PRINT@224," AND SAY THAT I
'LL BE THERE E'ER L
ONG.":SCREEN0,1:PLAY"FGFL2AFFGL1
FL2F"
890 GOSUB1220
900 CLS:PRINT@167,"I'VE BEEN WOR
KING":PRINT@200,"ON THE RAILROAD
":PRINT@271,"A":PRINT@331,"FOLK
SONG":SCREEN0,1
910 GOSUB1220
920 CLS4:FORB=32 TO 448 STEP22:P
RINT@B,"I'VE"CHR$(191)"BEEN";:NE
XT:SCREEN0,1:PLAY"T4O2L2FL4C"
930 CLS4:FORB=32 TO 479 STEP25:P
RINT@B,"WORKING"CHR$(191)"ON";:N
EXT:SCREEN0,1:PLAY"FCF"
940 CLS4:FORB=33 TO 479 STEP23:P
RINT@B,"THE"CHR$(191)"RAILROAD";
:NEXT:SCREEN0,1:PLAY"GL1AF"
950 GOSUB1220
960 GOSUB1240
970 PRINT@232,"I'VE BEEN WORKING
":PRINT@265,"ON THE RAILROAD":PL
AY"T5L2.FL4CFCFGL1AF"
980 PRINT@224,"":PRINT@262,"ALL
THE LIVE LONG DAY,":PLAY"L2.B-L4
B-L2FGL1AA"
990 PRINT@232,"I'VE BEEN WORKING
":PRINT@262," ON THE RAILROAD"
:PLAY"L2.FL4CFCFGL1AL2F"
1000 PRINT@231," JUST TO PASS"
:PRINT@264," THE TIME AWAY.":PLA
Y"L4AAL2AGGAL1GG"
1010 PRINT@232," CAN'T YOU HEAR"
:PRINT@262,"THE WHISTLE BLOWING,
":PLAY"L2.GL4GF#GAGL1FC"

```

```

1020 PRINT@233,"RISE UP SO EARLY
":PRINT@261," IN THE MORN,"
:PLAY"L2B-L4B-B-FFGGL1AA"
1030 PRINT@233,"CAN'T YOU HEAR":
PRINT@262,"THE CAPTAIN SHOUTING"
:PLAY"L2.DL4EFEFDL1CL2F"
1040 PRINT@230," 'OH, DINAH"
:PRINT@262," BLOW YOUR HORN.'"
:SCREEN0,1:PLAY"GAB-AGL1FL2F"
1050 GOSUB1220
1060 CLS:PRINT@165,"AMERICA, THE
BEAUTIFUL":PRINT@258,"WORDS BY
KATHARINE LEE BATES":PRINT@293,"
MUSIC BY SAMUEL A. WARD":SCREEN0
,1
1070 GOSUB1220
1080 CLS3:FORB=34 TO 450 STEP20:
PRINT@B,"AMERICA!";:NEXT:SCREEN0
,1:PLAY"L2GO3L2.EL4EL2DCL2.CO2L4
BL2B"
1090 GOSUB1220
1100 GOSUB1240
1110 PRINT@224," O BEAUTIFUL FOR
SPACIOUS SKIES FOR AMBER WA
VES OF GRAIN,":PLAY"T4O2L2GL2.GL
4EL2EGL2.GL4DL2DEFGABL1GL2G"
1120 PRINT@224," FOR PURPLE MOU
NTAIN MAJESTIES ABOVE THE F
RUITED PLAIN!":PLAY"L2GL2.GL4EL2
EGL2.GL4DL2DO3DC#DEO2AO3L1DL2D"
1130 PRINT@224," AMERICA!
AMERICA! GOD SHED HIS
GRACE ON THEE,":PLAY"O2L2GO3L2.E
L4EL2DCL2.CO2L4BL2BO3CDO2BAGO3L1
CL2C"
1140 PRINT@224," AND CROWN
THY GOOD WITH BRO
THERHOOD":PLAY"CL2.CO2L4AL2AO3L2
CL2.CO2L4GL2G"
1150 PRINT@224,"":PRINT@261,"FRO
M SEA TO SHINING SEA.":SCREEN0,1
:PLAY"GAO3CO2GO3DL1CL2C"
1160 GOSUB1220
1170 CLS6:FOR B=65 TO 74:PRINT@B
,"THAT'S";:NEXT B
1180 FOR B=166TO169:PRINT@B,"ALL
";:NEXT B
1190 FOR B=269TO278:PRINT@B,"FOL
KS"CHR$(33);:NEXT:SCREEN0,1:PLAY
"T255ABCDEFGFGABCDEFABCDEFABC"
1200 FOR B=396 TO 404:PRINT@B,CH
R$(33)"THE"CHR$(223)"END"CHR$(33
);:NEXT:SCREEN0,1
1210 GOTO1210
1220 FOR X=1 TO 3000:NEXT
1230 RETURN
1240 CLSRND(8):PRINT@224,STRING$
(34," ")
1250 RETURN

```



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# I Want My CoCo

By Becky and David Matthews

**C**oCoTV is no longer a distant dream. CoCoTV is here today! Watch the graphics video generated by the program while you listen to the original song recording of "Shadow of the Rings" on this month's RAINBOW ON TAPE. Your usually mild-mannered computer turns into CoCoTV with a music video of its very own. Follow the loading instructions and you'll want your CoCoTV, too.

The speed-up POKE is used in Line 40. This program uses many timing loops and can work without the speed-up POKE, but it will not be synchronized with the music.

Before loading the program, type PCLEAR B to free two Hi-Res graphics screens, then CLOAD "SHADOW" and run. The program first prompts for a color test (lines 50 through 80). Follow the instructions on the screen. Next is the cassette test (lines 90 through 110).

The Play button on the recorder should be pressed and the TV volume should be up (if it is, you hear sound effects during the two tests). When ENTER is pressed (for "yes" to the cassette test), the cassette is started (Line 170) and the countdown begins. Line 190 displays the countdown from eight to one. Welcome to CoCoTV!

*Becky and David Matthews freelance in electronics, computers and music. When they perform live music (with their robot face sidekick), they are known as Adobe Pagoda.*

Shadow uses its own built-in alphabet to display words on Hi-Res graphics screens. In Line 150 the array for 26 letters is dimensioned — DIML\$(26). Subroutine 2230 has the DRAW substrings to draw each letter. The letters are used in lines 2590 through 2770 of the title page subroutine to write "Shadow of the Rings" on the title page screen and in lines 620 through 1970 to display the lyrics of the song bridge.

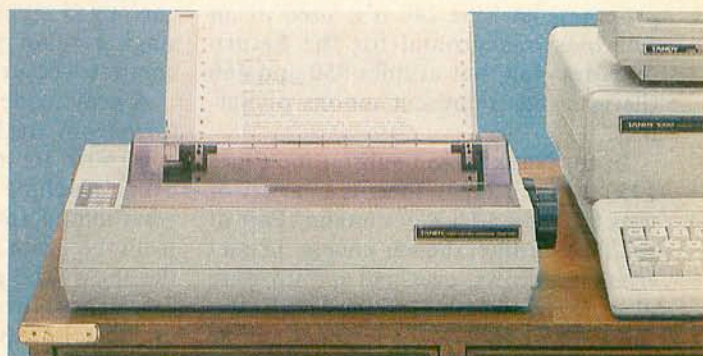
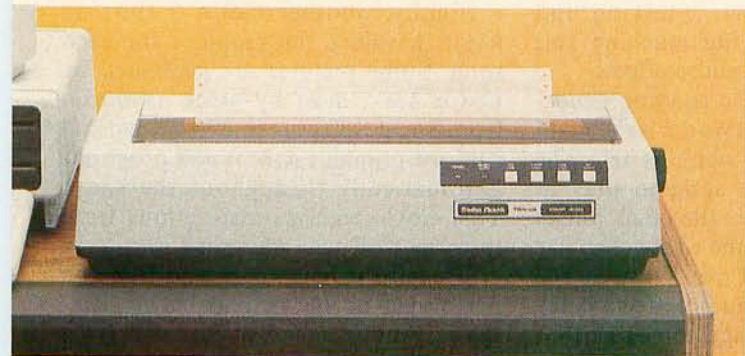
Note in Line 2590 and Line 620, S4 has been specified to define the size of the DRAW commands. Changing S4 to S2 makes the letters half their original size. Similarly, S6 makes them twice as large. The only other information needed to use this alphabet is the X,Y coordinates (where to start drawing the letter) and which letter to draw. L\$(1) is the letter 'A', L\$(2) is 'B', L\$(3) is 'C', and so on.

Using Line 2600 as an example, S4 is the 'X' position, 66 is the 'Y' position and L\$(8) is the letter 'H'. See the letters subroutine (lines 2230 through 2460) for easy reference to which letter is which element of the L\$ array. Letters 'L', 'Q', 'X' and 'Z' are not defined in the letters subroutine. Every letter except 'I' is 20 steps across and 28 steps up and down.

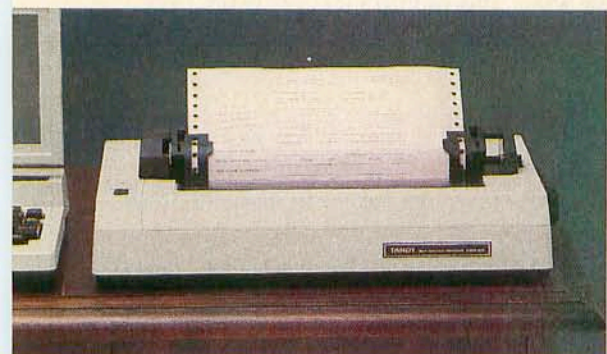
Knowing this, you can finish the alphabet. Starting with an easy letter, write your own 'L' DRAW substring, which is L\$(12). Add it to the program as Line 2345. Now try adding the letter 'Q', L\$(17) at Line 2385. For hints, look at Line 2370, which draws the letter 'O'. Continue and add 'X', L\$(24), Line 2445 and 'Z', L\$(26), Line 2455, and you have



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a complete alphabet — a new font of letters to use on the graphics screens.

The asteroids subroutine (starting at Line 2530) is called several times in the program. At Line 240 it is used as an asteroids background for the Saturn man drawing, but at lines 350 and 460 the asteroids represent moons of Saturn.

In the Saturn man subroutine (lines 1990 through 2220), there is a variety of uses for the CIRCLE command. Part of the face outline, the ear covers, helmet front, eyebrows, eyes and mouth were all drawn with CIRCLE. Line 2210 draws the word TITAN on the screen in simple block letters.

All drawings of Saturn are done with CIRCLE. The routines that shimmer the rings also use CIRCLE, but vary the color (variable C) and the step (variable V). See the Medium Saturn, Large Saturn and Big Rings subroutines.

#### About the Musical Group

"Adobe Pagoda" is a live musical show performed by Becky and David

Matthews using three CoCos to provide multimedia excitement. The show includes CoCo graphics displayed on a large-screen TV, a 12-channel synchronized light show, a talking and singing robot face, fog machine and computer-controlled audio effects.

A gray model CoCo running *Colorforth* from The MicroWorks is the main controller for the system. It tells the drum machine what song to play at what tempo and reads the clock pulses from the drum machine to synchronize the show. The gray CoCo controls the fog, light show and audio effects delay line to follow pre-programmed actions unique to each song. This CoCo also sends synchronizing triggers to the CoCo used for graphics, and control signals to the CoCo used for the robot face and voice. The gray CoCo uses five PIAs for I/O.

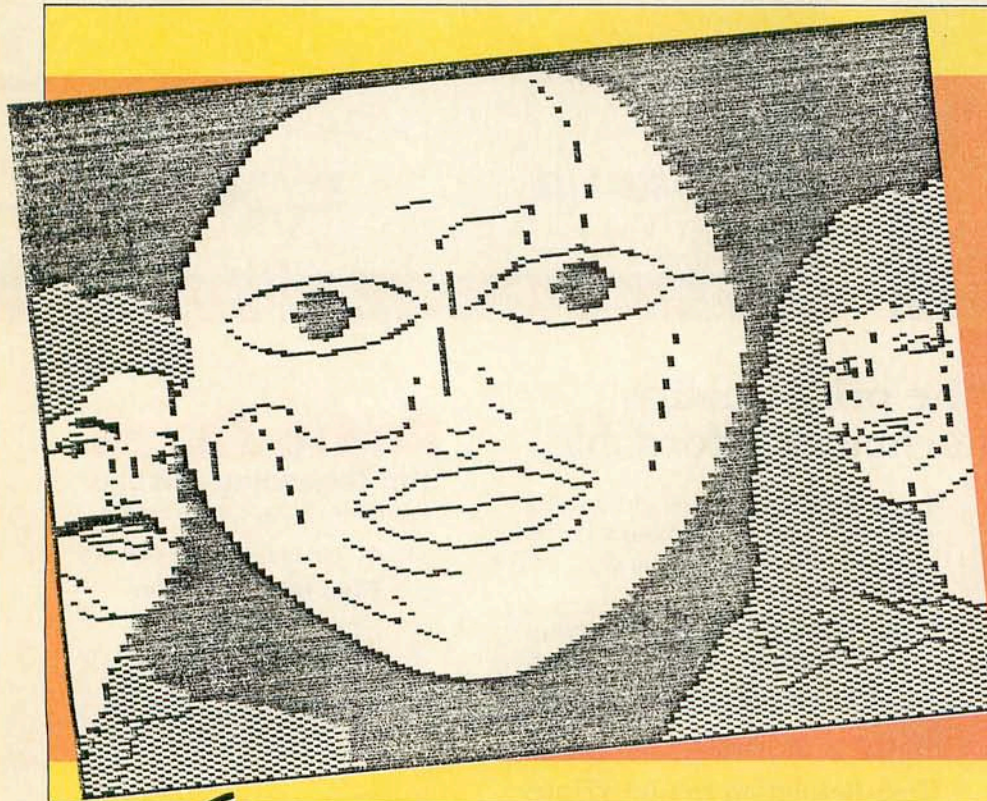
A CoCo 2 running *Colorforth* from Armadillo International Software controls the robot face with lights for the eyes and mouth synchronized to the voice. The voice is generated by an SSI

263 voice chip. This CoCo receives numerical data that tells it what speech/sound effect routine to perform via the RS-232 port from the gray CoCo.

Finally, another CoCo 2 running BASIC provides the graphics for each song. Some pictures are generated by *CoCo Max*, most by BASIC. *Autorun* from Sugar Software is used to load and run new graphics screens and programs automatically throughout the show. This CoCo receives instructions from the gray CoCo via a joystick port.

"Shadow of the Rings," written and performed by Becky and David Matthews, was recorded at Sound Vortex studio in Nashville with the help of Tom Steinman and Rob Earls. For a cassette of two additional original song recordings with an accompanying graphics program, send \$10 to 2415 Smith Springs Road, Nashville, TN 37217. □

**Editor's Note: The musical recording of "Shadow of the Rings" will immediately follow the *Shadow* program listing on this month's RAINBOW ON TAPE.**



#### SHADOW OF THE RINGS

By David and Becky Matthews

Once ran a gold mine in the asteroids  
I ran a crew of fifty androids  
I loved you son of a Saturn man  
I spent my leaves with you on Titan

Living in the shadow  
I'm living in the shadow of the rings  
Living in the shadow  
I'm living in the shade of Saturn's rings

Can't kiss you now my blue-skin beauty  
Your father felt it was his duty  
He sent me here to mine the ice rings  
He keeps me busy with so many things

Ammonia gas seeps into my ship  
As I suit up for the day  
I shoot my shipments out into your orbit  
But I know I can never come that way.

\*Song Copyright 1985 D. and B. Matthews

190 .....12	2180 .....158
440 .....11	2330 .....196
640 .....239	2470 .....158
950 .....80	2660 .....49
1230 .....173	2820 .....237
1550 .....0	2910 .....92
1830 .....218	END .....19
2060 .....116	

#### The listing: SHADOW

```

1Ø '****"SHADOW" BY B. MATTHEWS
2Ø '**SONG "SHADOW OF THE RINGS"
   COPYRIGHT 1983 D. & B. MATTHEWS
3Ø 'SPEED-UP POKE
4Ø POKE65495,Ø
  
```



```

50 'COLOR TEST
60 A$=INKEY$:CLS:PRINT"RED?
  PRESS ENTER.";:PRINT@64,"BLUE
?   STOP CASSETTE, BREAK, RES
ET AND RUN.";:FORT=1TO15:NEXTT
70 PMODE4:PCLS:SCREEN1,1:PMODE3:
PCLS6:PLAY"O2T255CDEFGABC"
80 IFA$<>CHR$(13)THEN60
90 'CASSETTE TEST
100 CLS7:PRINT"CASSETTE ON PLAY?
  VOLUME UP?   (ENTER FOR YES)"
;
110 PLAY"O1T255BAGFEDC":A$=INKEY
$:IFA$<>CHR$(13)THEN110
120 'SET COLORS
130 M=2:W=3:Q=2:U=1:E=0
140 'LETTERS
150 DIML$(26):GOSUB2230
160 'START CASSETTE
170 MOTOR ON:AUDIO ON
180 'COUNT-OFF
190 C=3:FORN=8TO1STEP-1:CLSC:PRI
NT@238,N;:FORT=1TO60:NEXTT:C=C+
1:IFC>8THENC=3
200 NEXTN
210 'GOSUB TITLE PAGE
220 GOSUB2570
230 'GOSUB ASTEROIDS
240 PMODE4,5:PCLS:SCREEN1,1:GOS
UB2530:FORT=1TO300:NEXTT
250 'GOSUB SATURN MAN
260 FORP=1TO4:PCOPYP+4TOP:NEXTP:
GOSUB1990
270 FORT=1TO230:NEXTT
280 'GOSUB MEDIUM SATURN
290 GOSUB2820
300 'GOSUB BIG RINGS
310 GOSUB2470
320 'GOSUB AMMONIA
330 PMODE4,1:PCLS1:SCREEN1,1:COL
OR0,1:GOSUB610
340 'GOSUB ASTEROIDS (MOONS)
350 PMODE4,5:PCLS:SCREEN1,1:GOSU
B2530
360 'GOSUB LARGE SATURN
370 GOSUB2900
380 FORT=1TO1000:NEXTT
390 'GOSUB SATURN MAN
400 PMODE4,1:PCLS:E=1:GOSUB1990
410 'FLICKER
420 FORT=1TO990:PMODE4,5:SCREEN1
,0:PMODE4,1:SCREEN1,1:NEXTT
430 'GOSUB AMMONIA
440 PMODE4,1:PCLS1:SCREEN1,1:COL

```

```

OR0,1:GOSUB610
450 'GOSUB ASTEROIDS (MOONS)
460 PMODE4,5:PCLS:SCREEN1,1:PCLS
0:GOSUB2530
470 'GOSUB STARS
480 GOSUB2980
490 'GOSUB MEDIUM SATURN
500 GOSUB2820
510 FORT=1TO1000:NEXTT
520 'GOSUB TITLE PAGE
530 GOSUB2570
540 'FLICKER
550 FORP=1TO500:PMODE3,1:SCREEN1
,1:SCREEN1,0:PMODE4,1:SCREEN1,1:
NEXTP
560 'STOP CASSETTE
570 MOTOR OFF:AUDIO OFF:POKE6549
4,0
580 'CREDITS
590 CLS3:PRINT@103,"SHADOW OF TH
E RINGS";:PRINT@233,"BY B. MATTH
EWS";:PRINT@457,"SONG COPYRIGHT"
;:PRINT@485,"1983 D. AND B. MATT
HEWS";:FORT=1TO700:NEXTT:CLS0
600 END
610 '*AMMONIA SUB- WRITE AMMONIA
620 DRAW"BM44,30S4"+L$(1)
630 DRAW"BM64,30"+L$(13)
640 DRAW"BM94,30"+L$(13)
650 DRAW"BM124,30"+L$(15)
660 DRAW"BM150,30"+L$(14)
670 DRAW"BM176,30"+L$(9)
680 DRAW"BM200,30"+L$(1)
690 'GAS
700 DRAW"BM12,70"+L$(7)
710 DRAW"BM44,70"+L$(1)
720 DRAW"BM64,70"+L$(19)
730 'SEEPS
740 DRAW"BM114,70"+L$(19)
750 DRAW"BM140,70"+L$(5)
760 DRAW"BM166,70"+L$(5)
770 DRAW"BM192,70"+L$(16)
780 DRAW"BM218,70"+L$(19)
790 'INTO
800 DRAW"BM76,110"+L$(9)
810 DRAW"BM94,110"+L$(14)
820 DRAW"BM120,110"+L$(20)
830 DRAW"BM146,110"+L$(15)
840 'MY
850 DRAW"BM36,150"+L$(13)
860 DRAW"BM66,150"+L$(25)
870 'SHIP
880 DRAW"BM114,150"+L$(19)
890 DRAW"BM140,150"+L$(8)

```



```

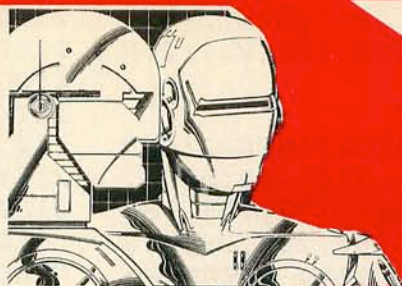
900 DRAW"BM166,150"+L$(9)
910 DRAW"BM184,150"+L$(16)
920 FORT=1TO3800:NEXTT:PCLS1
930 'AS
940 DRAW"BM76,30"+L$(1)
950 DRAW"BM96,30"+L$(19)
960 'I
970 DRAW"BM152,30"+L$(9)
980 'SUIT
990 DRAW"BM40,70"+L$(19)
1000 DRAW"BM66,70"+L$(21)
1010 DRAW"BM92,70"+L$(9)
1020 DRAW"BM110,70"+L$(20)
1030 'UP
1040 DRAW"BM162,70"+L$(21)
1050 DRAW"BM188,70"+L$(16)
1060 'FOR
1070 DRAW"BM36,110"+L$(6)
1080 DRAW"BM62,110"+L$(15)
1090 DRAW"BM88,110"+L$(18)
1100 'THE
1110 DRAW"BM142,110"+L$(20)
1120 DRAW"BM168,110"+L$(8)
1130 DRAW"BM194,110"+L$(5)
1140 'DAY
1150 DRAW"BM84,150"+L$(4)
1160 DRAW"BM116,150"+L$(1)
1170 DRAW"BM136,150"+L$(25)
1180 FORT=1TO3700:NEXTT:PCLS1
1190 'I
1200 DRAW"BM110,0"+L$(9)
1210 'SHOOT
1220 DRAW"BM22,32"+L$(19)
1230 DRAW"BM48,32"+L$(8)
1240 DRAW"BM74,32"+L$(15)
1250 DRAW"BM100,32"+L$(15)
1260 DRAW"BM126,32"+L$(20)
1270 'MY
1280 DRAW"BM174,32"+L$(13)
1290 DRAW"BM204,32"+L$(25)
1300 'SHIPMENTS
1310 DRAW"BM8,64"+L$(19)
1320 DRAW"BM34,64"+L$(8)
1330 DRAW"BM60,64"+L$(9)
1340 DRAW"BM78,64"+L$(16)
1350 DRAW"BM104,64"+L$(13)
1360 DRAW"BM134,64"+L$(5)
1370 DRAW"BM160,64"+L$(14)
1380 DRAW"BM186,64"+L$(20)
1390 DRAW"BM212,64"+L$(19)
1400 'OUT
1410 DRAW"BM20,96"+L$(15)
1420 DRAW"BM46,96"+L$(21)
1430 DRAW"BM72,96"+L$(20)
1440 'INTO
1450 DRAW"BM120,96"+L$(9)
1460 DRAW"BM138,96"+L$(14)
1470 DRAW"BM164,96"+L$(20)
1480 DRAW"BM190,96"+L$(15)

1490 'YOUR
1500 DRAW"BM60,128"+L$(25)
1510 DRAW"BM86,128"+L$(15)
1520 DRAW"BM112,128"+L$(21)
1530 DRAW"BM138,128"+L$(18)
1540 'ORBIT
1550 DRAW"BM52,160"+L$(15)
1560 DRAW"BM78,160"+L$(18)
1570 DRAW"BM104,160"+L$(2)
1580 DRAW"BM130,160"+L$(9)
1590 DRAW"BM148,160"+L$(20)
1600 FORT=1TO3400:NEXTT:PCLS1
1610 'BUT
1620 DRAW"BM86,10"+L$(2)
1630 DRAW"BM112,10"+L$(21)
1640 DRAW"BM138,10"+L$(20)
1650 'I
1660 DRAW"BM24,44"+L$(9)
1670 'KNOW
1680 DRAW"BM66,44"+L$(11)
1690 DRAW"BM92,44"+L$(14)
1700 DRAW"BM118,44"+L$(15)
1710 DRAW"BM144,44"+L$(23)
1720 'I
1730 DRAW"BM196,44"+L$(9)
1740 'CAN
1750 DRAW"BM4,78"+L$(3)
1760 DRAW"BM36,78"+L$(1)
1770 DRAW"BM56,78"+L$(14)
1780 'NEVER
1790 DRAW"BM110,78"+L$(14)
1800 DRAW"BM136,78"+L$(5)
1810 DRAW"BM162,78"+L$(22)
1820 DRAW"BM188,78"+L$(5)
1830 DRAW"BM214,78"+L$(18)
1840 'COME
1850 DRAW"BM4,112"+L$(3)
1860 DRAW"BM30,112"+L$(15)
1870 DRAW"BM56,112"+L$(13)
1880 DRAW"BM86,112"+L$(5)
1890 'THAT
1900 DRAW"BM136,112"+L$(20)
1910 DRAW"BM162,112"+L$(8)
1920 DRAW"BM194,112"+L$(1)
1930 DRAW"BM214,112"+L$(20)
1940 'WAY
1950 DRAW"BM86,146"+L$(23)
1960 DRAW"BM118,146"+L$(1)
1970 DRAW"BM138,146"+L$(25)
1980 FORT=1TO4000:NEXTT:RETURN
1990 '*SATURN MAN SUB- DRAW FACE
2000 'OUTLINE FACE
2010 PMODE4,1:SCREEN1,1:COLOR1,0
: DRAW"BM180,97C1S6M164,138G15L20
H15M78,97BM125,154R4"
2020 CIRCLE(129,70),70,1,.92,.37
,.99:CIRCLE(129,70),70,1,.92,0,.
15
2030 'EAR COVERS

```



# Robot Odyssey I



Adventure game or advanced education? You decide! **Robot Odyssey I** is divided into 3 parts: a **tutorial** that teaches the basics of robot anatomy and circuit design; the **lab**, where you practice building robots to perform specific tasks; and the **game**, an adventure that challenges you to escape from Robotropolis.

Robotropolis is an underground city inhabited by both friendly and bothersome robots. It is built in five levels, so your escape must be achieved in five increasingly more difficult stages. First is the sewer where friendly robots aid your escape. In the next level, the subway, you must rewire a robot. At the fourth level you get to the master control center. Finally, you reach the skyways. Less than 5% ever solve the last level!

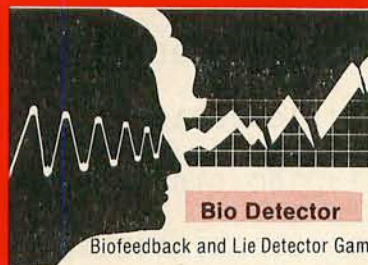
Each robot has one eye, a grabber, an antenna to send and receive signals, four thrusters for guidance, four bumpers that detect walls, and a rechargeable battery. You must learn to operate these robots, including modifying and designing their inner circuitry, to escape from Robotropolis.

In addition to having great fun and adventure, you will learn a great deal about the inside of robots, integrated circuitry, and logic. **Robot Odyssey I** is the ultimate puzzle, requiring much time and effort while providing big rewards in return!

Requires 64K, Disk \$34.95

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Learn the art of relaxation through biofeedback - or use the same device for party fun as a lie detector game. Software for both is included. The Bio Detector works through silver finger sensors attached to the Bio Detector unit which plugs into the joystick port. Your galvanic skin response is plotted in hires color graphics and sound. Learn stress reduction easily by watching your responses on the screen. The Anxiety Attack Game will provide hours of embarrassing and truthful fun as well. All hardware, software, and instructions are included.

Requires 16K \$24.95

## Advanced OS-9 Utilities

by Brian Lantz

**KSHELL** allows wildcard with any utility! Includes **PATH** for multiple path directories, **UNLOAD** for repetitive unlinks, **FLINK** for alternative boot files, **ARCHIVE** to backup large media to small media, & **CPY**.

Serious OS-9 users cannot do without this set of utilities!

Requires 64K, OS-9 \$29.95

## Disk Fix & OS-9 Utilities

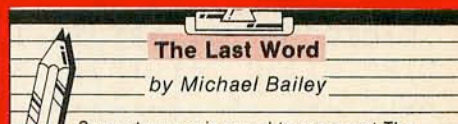
by Harry Hardy

Unleash the real power of OS-9! **DISK FIX** supports true double-sided, double-density, 40 or 80 tracks, and step rates up to 6 ms - and each drive is configured separately! (CCDISK included)

**DMODE** allows super easy modification of drive descriptors. **DIRCOPY** is a powerful copy utility. **PATCH** lets you inspect & modify a disk file. **FILELOOK** displays file modules without loading. **COMPARE** compares a file to memory.

Includes modules for 1.X and 2.X OS-9!

Requires 64K, OS-9 \$34.95



## The Last Word

by Michael Bailey

Computerware is proud to represent The Last Word by Michael Bailey of United Software. We chose The Last Word because it is truly the ultimate OS-9 word processor!

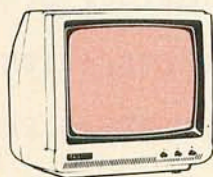
The Last Word offers fast, on-screen formatting using your choice of mouse, joystick or keyboard. The popdown menu is accessible at all times while inputting text so it is very easy to use. The Last Word provides the capability to move, insert or delete blocks of text, paragraphs, lines, or characters with just a click of the mouse or joystick or the touch of a key.

The Last Word is compatible with Word-Pak or you can use its own hires 51x24 display. You open files just by pointing to names on a directory menu. Once the file is open, you can move freely within the file from top to bottom and back again. If using it with Word-Pak, you have a 22,000 word dictionary on-line at your fingertips!

You can easily imbed your printer's special codes in your files. With more than 30 screen editing commands available, it's simple to format or reformat as necessary. Change the margins, double or single space, etc. using the pop-down menus. The Last Word is very easy to use and learn. It will be a staple in your OS-9 library!

Requires 64K, OS-9 \$49.95

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Checks are delayed for bank clearance		



```

2040 FOR R=1TO11STEP2:CIRCLE(71,
95),R,1,2:CIRCLE(185,95),R,1,2:N
EXTR
2050 'HELMET FRONT
2060 H=.60:FOR Y=94TO104STEP2:CIR
CLE(129,Y),80,1,H,.625,.88:H=H+.
05:NEXT Y:LINE(72,60)-(73,75),PSE
T,B:LINE(184,60)-(185,75),PSET,B
2070 'PAINT HELMET,DRAW EYEBROWS
2080 DRAW"BM199,66S4C1D4":POKE17
8,145:PAINT(140,30),,1
2090 FOR Y=73TO77STEP2:CIRCLE(152
,Y),15,1,.6,.62,.95:CIRCLE(104,Y
),15,1,.6,.55,.9:NEXT Y
2100 'EYES
2110 CIRCLE(152,88),15,1,.8,.62,
.9:CIRCLE(104,88),15,1,.8,.6,.9:
CIRCLE(152,76),15,1,.8,.1,.41:CI
RCLE(104,76),15,1,.8,.1,.4
2120 PAINT(146,82),1,1:PAINT(100
,82),1,1:FOR R=1TO4STEP2:CIRCLE(
152,82),R,0:CIRCLE(104,82),R,0:N
EXT R
2130 'NOSE AND MUSTACHE
2140 DRAW"BM125,86C1S8D2M120,116
F1R2BR2R1BD1L2G1H1L2G1L2G1L2G3R3
E1R1M125,126M135,128R2E1R1E4L3G2
L2H1L2BM157,114C1S4F2D2"

```

```

2150 'MOUTH AND PAINT FACE
2160 CIRCLE(126,122),20,1,.5,1,.
4:POKE178,U:PAINT(128,128),,1:PA
INT(128,130),,1:POKE178,Q:PAINT(
140,80),,1
2170 'OUTLINE EYES
2180 CIRCLE(152,88),15,0,.8,.62,
.9:CIRCLE(104,88),15,0,.8,.6,.9:
CIRCLE(152,76),15,0,.8,.1,.41:CI
RCLE(104,76),15,0,.8,.1,.4:IFE=1
THEN RETURN
2190 FORT=1TO2000:NEXT T
2200 'WRITE "TITAN"
2210 DRAW"BM12,148C1S2R8ND16R8BR
8D16BR16U16NL8R8BR8G8NR14D8BR16U
8H8BR16ND16F12ND4U12BF8BR4R18NG6
H6"
2220 RETURN
2230 '*LETTERS SUBROUTINE
2240 L$(1)="R10F4D24L4U12L12D12L
4U24E4BD4BR4R4F4D4L12U4E4":'A
2250 L$(2)="R16F4D6G4F4D6G4L16U2
8BF4R10F2D3G3L4D4R4F3D3G2L10U20"
:'B
2260 L$(3)="R20D4L16D20R16D4L20U
28":'C
2270 L$(4)="R16F4D20G4L16U28BF4R
10F2D16G2L10U20":'D
2280 L$(5)="R20D4L16D8R12D4L12D8
R16D4L20U28":'E
2290 L$(6)="R20D4L16D8R12D4L12D1
2L4U28":'F
2300 L$(7)="R20D8L4U4L12D20R12U6
L4U4R8D14L20U28":'G
2310 L$(8)="R4D12R12U12R4D28L4U1
2L12D12L4U28":'H
2320 L$(9)="R12D4L4D20R4D4L12U4R
4U20L4U4":'I
2330 L$(10)="R12D4L4D24L16U8R4D4
R8U20L4U4":'J
2340 L$(11)="R4D12E10U2R6D2G12F1
2D2L6U2H10D12L4U28":'K
2350 L$(13)="R4F8E8R4D28L4U22G8H
8D22L4U28":'M
2360 L$(14)="R4F12U12R4D28L4U10H
12D22L4U28":'N
2370 L$(15)="R20D28L20U28BF4R12D
20L12U20":'O
2380 L$(16)="R16F4D8G4L12D12L4U2
8BF4R10F2D4G2L10U8":'P
2390 L$(18)="R20D16L10F10D2L6U2H
10D12L4U28BF4R12D8L12U8":'R
2400 L$(19)="R20D8L4U4L12D8R16D1
6L20U8R4D4R12U8L16U16":'S
2410 L$(20)="R20D4L8D24L4U24L8U4
":'T
2420 L$(21)="R4D24R12U24R4D28L20
U28":'U
2430 L$(22)="R4D16F6E6U16R4D18G1

```

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```

ØH1ØU18":'V
244Ø L$(23)="R4D22E6F6U22R4D28L4
H6G6L4U28":'W
245Ø L$(25)="R4D6F6E6U6R4D8G8D12
L4U12H8U8":'Y
246Ø RETURN
247Ø '*BIG RINGS SUBROUTINE
248Ø PMODE4,1:PCLSØ:SCREEN1,1:CO
LOR7,6:FORS=1TO9Ø:X=12+RND(233):
Y=12+RND(167):PSET(X,Y,7):NEXTS:
PMODE3,1:FORR=1TO3Ø:CIRCLE(128,9
5),R,M,.9:NEXTR
249Ø PMODE3,1:V=3:C=2:FORT=1TO21
:FORR=9ØTO55STEP-V:CIRCLE(128,95
),R,C,.95:NEXT R:C=C+1:IFC=>9THE
NC=1

```



```

250Ø V=V+1
251Ø NEXTT
252Ø RETURN
253Ø '*ASTEROIDS (MOONS) SUB
254Ø PMODE4,5:PCLS:GOSUB298Ø:FOR
X=ØTO6STEP2:LINE(X,Ø)-(X,192),PS
ET:LINE(X+248,Ø)-(X+248,192),PSE
T:NEXTX
255Ø FORR=1TO3STEP2:CIRCLE(67,55
),R,1:CIRCLE(145,4Ø),R,1:CIRCLE(
8Ø,35),R,1:CIRCLE(18Ø,13Ø),R,1:C
IRCLE(35,9Ø),R,1:NEXTR
256Ø FORR=1TO6STEP2:CIRCLE(82,15
2),R,1:NEXTR:RETURN
257Ø '*TITLE PAGE SUBROUTINE
258Ø 'SHADOW
259Ø PMODE4,1:PCLS:SCREEN1,1:COL

```

```

OR1,Ø:DRAW"BM28,66S4"+L$(19)
260Ø DRAW"BM54,66"+L$(8)
261Ø DRAW"BM86,66"+L$(1)
262Ø DRAW"BM1Ø6,66"+L$(4)
263Ø DRAW"BM132,66"+L$(15)
264Ø DRAW"BM158,66"+L$(23)
265Ø 'OF
266Ø DRAW"BM48,1Ø2"+L$(15)

```



```

267Ø DRAW"BM74,1Ø2"+L$(6)
268Ø 'THE
269Ø DRAW"BM118,1Ø2"+L$(2Ø)
270Ø DRAW"BM144,1Ø2"+L$(8)
271Ø DRAW"BM17Ø,1Ø2"+L$(5)
272Ø 'RINGS
273Ø DRAW"BM8Ø,138"+L$(18)
274Ø DRAW"BM1Ø6,138"+L$(9)
275Ø DRAW"BM124,138"+L$(14)
276Ø DRAW"BM15Ø,138"+L$(7)
277Ø DRAW"BM178,138"+L$(19)
278Ø 'DRAW SMALL SATURN
279Ø COLOR1,Ø:FORX=1TO1ØSTEP2:LI
NE(X,X)-(256-X,191-X),PSET,B:NEX
TX:X=198:Y=4Ø
280Ø FOR R=ØTO19:CIRCLE(X,Y),R:N
EXTR:FORR=23TO35STEP3:CIRCLE(X,Y
),R,1,.27:NEXTR:GOSUB298Ø:IFE=1T
HENRETURN
281Ø FORT=1TO75:PMODE3,1:SCREEN1
,Ø:FORR=1TO5Ø:NEXTR:PMODE4,1:SCR
EEN1,1:FORR=1TO5Ø:NEXTR:NEXTT:RE
TURN
282Ø '*MEDIUM SATURN SUBROUTINE
283Ø PMODE4,5:SCREEN1,1:X=126:Y=
9Ø:FORR=ØTO3Ø:CIRCLE(X,Y),R:NEXT

```



# The Crossword Creator Contest

Can you create a totally symmetrical crossword puzzle using the *Word+* program and the specifications outlined in the accompanying article on Page 38 of the May 1986 issue of *THE RAINBOW*? If so, you may wish to enter The Crossword Creator Contest. And, if we choose to print your crossword puzzle, you will be awarded a special prize.

Send us a disk or cassette copy of the data file of your puzzle created by *Word+* along with a printed copy of the crossword puzzle — including the clues and answers. Be sure to put a title on the puzzle and if possible, follow a general interest theme.

Entries will be judged on the following criteria:

- Puzzle symmetry
- Number of words
- Spelling
- Creativity
- Thematic originality
- Understandability
- Ease of loading data
- Neatness
- Packaging

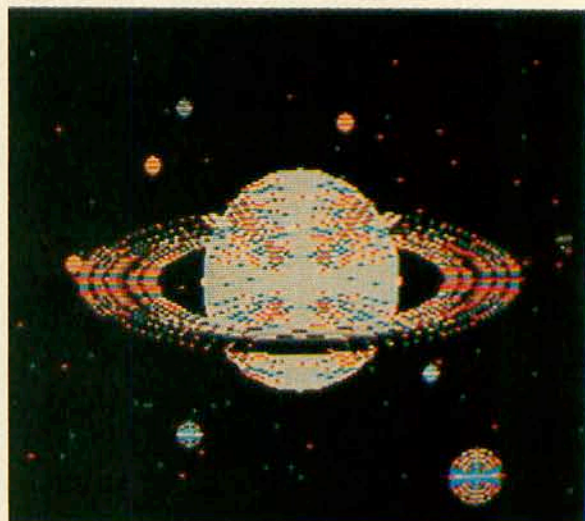
Enter as often as you like! Please note: We consider your act of entering the contest as consent to publish your creation.

The Crossword Creator Contest is open to all *RAINBOW* readers, advertisers and employees of Falsoft, Inc.

**Send entries to:**  
**Crossword Creator Contest**  
**c/o THE RAINBOW**  
**The Falsoft Building**  
**P.O. Box 385**  
**Prospect, KY 40059**

R

```
2840 FORR=40TO50STEP4:CIRCLE(X,Y
),R,1,0.25,0,.65:CIRCLE(X,Y),R,1
,0.25,.85,.99:NEXTR
2850 FORR=56TO62STEP4:CIRCLE(X,Y
),R,1,0.25,0,.69:CIRCLE(X,Y),R,1
,0.25,.81,.99:NEXTR
2860 V=2:C=1:FORT=1TO19:FORR=40T
O52STEPV:CIRCLE(X,Y),R,C,.25,0,.
624:CIRCLE(X,Y),R,C,.25,.875,.99
:NEXTR
2870 FOR R=56TO62STEPV:CIRCLE(X,
Y),R,C,.25,0,.67:CIRCLE(X,Y),R,C
,.25,.844,.99:NEXTR:V=V+1:C=C-1:
IFC=-1THENC=1
2880 IFV>5THENV=2
2890 NEXTT:RETURN
2900 '*LARGE SATURN SUBROUTINE
2910 PMODE4,5:COLOR1,0:SCREEN1,1
```



```
:X=127:Y=96:FORR=1TO11STEP2:CIRC
LE(200,170),R,1:NEXTR:FORR=1TO40
:CIRCLE(X,Y),R,1:NEXTR
2920 FORR=60TO70STEP3:CIRCLE(X,Y
),R,1,.3,0,.67:CIRCLE(X,Y),R,1,.
3,.845,.99:NEXTR:FORR=74TO90STEP
3:CIRCLE(X,Y),R,1,.3,0,.689:CIRC
LE(X,Y),R,1,.3,.815,.99:NEXTR
2930 V=2:C=1:FORT=1TO7:FOR R=60T
O70STEPV:CIRCLE(X,Y),R,C,.3,0,.6
4:CIRCLE(X,Y),R,C,0.3,.86,.99:NE
XTR
2940 FOR R=74TO90STEPV:CIRCLE(X,
Y),R,C,.3,0,.680:CIRCLE(X,Y),R,C
,.3,.831,.99:NEXTR:V=V+1:C=C-1:I
FC=-1THENC=1
2950 IFV>7THENV=2
2960 NEXTT:RETURN
2970 '*STARS SUBROUTINE
2980 FORS=1TO80:X=12+RND(233):Y=
12+RND(167):PSET(X,Y,5):NEXTS:RE
TURN
```



# Music+:

## New Commands, No Bugs

By Bob Ludlum

Since *Music+* appeared in RAINBOW ("Making Four-Part Harmony Easier," June 1984, Page 74) I've received a large response from *Music+* users with questions and requests for additional features. As a result, I've fixed a minor bug and added two new commands to the program.

If you're not familiar with *Music+*, it's an enhanced version of Larry Konecky's *CoCo Composing* (RAINBOW, December 1983). It is a BASIC program that loads a machine language music synthesis program. A screen editor facilitates the entry, editing and playing of four-part music. It requires a 32K Color Computer with Extended BASIC and runs without modification on both tape and disk systems.

I want to answer some questions I received repeatedly. First, is it possible to add more voices and octaves? Yes, relatively simple modifications to the editor and synthesis programs are all that is required, but a tradeoff exists between the added complexity and the quality of the sounds produced.

*Music+* synthesizes the music wave form by summing the contributions from the four voices at equally spaced time intervals. The result is a sampled approximation of the desired wave form. The accuracy of the approximation depends on how often the samples are calculated (the sampling rate). The theoretical minimum rate required is two samples per cycle of the highest frequency component in the wave form. In practice, much higher rates are needed.

If the sampling rate is too low, unwanted frequency components appear in the wave form, a phenomenon known as "aliasing." *Music+* calculates a new wave form sample every 145 microseconds (6,896 samples per second), which is already marginal.

The second question frequently asked

*Bob Ludlum is an electronics design engineer and holds a master's degree in electrical engineering. Bob lives in Panama City, Florida, and his hobbies include electronics, personal computers, classical and flamenco guitar, and flying.*

was, "Why do I get a 'C' note when I enter a 'B' sharp and why do the notes jump from 'B' in one octave to 'C' in the next?"

The note table in *Music+* implements the equally tempered chromatic scale with a standard pitch of 440 Hertz (cycles per second) for 'A' in the fourth octave. Each octave begins with the note 'C' and is made up of 12 pitch intervals (half-steps). There is one half-step between 'B' and 'C', and between 'E' and 'F'. There are two half-steps between the rest of the notes with the sharps falling on the half-steps between.

For example, beginning with the third octave, the notes are C3, C3#, D3, D3#, E3, F3, F3#, G3, G3#, A3, A3#, B3, C4, C4#, etc. To raise a note one half-step, its pitch is multiplied by the twelfth root of two (approximately 1.0595).

The original *Music+* program had a bug that showed up when the music was saved following use of the (M)ove command. The (M)ove command changes the pointer (actually a branch instruction offset) to the start of the music data allowing a portion of a song to be played. Moving and then saving caused the wrong start location to be saved and the entire song would not play when executed. Playing before saving prevents the problem. Adding `POKE A9,0:POKE A9+1,128:` to the beginning of Line 625 of the original program fixes the bug.

The first of the new commands is (H)dcopy, which is used to dump the music data between specified note columns to a printer. The command simply lists each column number followed by the note length and the four note names for that column. The `POKE 150,18` in Line 9600 sets the Baud rate to 2400. Change it to match your printer, if necessary.

Turn the printer off when playing music. The synthesis program generates a byte (eight bits) to the output port that drives the CoCo's six-bit digital-to-analog converter. One of the lower-order bits appears on the serial port while music is playing and will cause your printer to do strange things!

The other new command is (W)form.



It allows changing the wave form table to produce sounds with different timbres. The program prompts for the percentages of the fundamental and the first four overtones of the music wave form. The 256 values for the new wave form table are calculated (in BASIC) by summing the scaled sinusoidal fundamental and the second through the fifth harmonics.

The new wave form table is in effect for played and saved music until *Music+* restores the table after RUN. The original *Music+* organ wave form has 50 percent fundamental, and 25 percent each for the second and third harmonics. The sum of the percentages should equal 100.

The machine language program is located immediately above the BASIC screen editor in order to maximize the amount of memory available for holding music data. Adding the new commands required either relocating the machine language program (which would have destroyed compatibility with existing *Music+* music files) or shrinking the BASIC program.

I decided on the latter and removed the unnecessary spaces and packed the lines. Unfortunately, doing so makes describing the necessary steps to update the original *Music+* program very difficult. I'll be happy to make a copy of the latest version of the program if you send me a tape or (preferably) a disk in

a self-addressed, stamped return mailer. My mailing address is 226 Pine Ridge Drive, Panama City, FL 32405.

I've been very pleased with the positive responses to *Music+* and hope the new commands will be useful. I'm especially grateful to all who were kind enough to send me some outstanding samples of their music. I encourage you to share your efforts with the readers of RAINBOW.

**Editor's Note:** Due to the length of the new and improved *Music+* program, we are unable to print the listing in THE RAINBOW. We will, however, include the modified *Music+* program on this month's RAINBOW ON TAPE. □

*Place these values into the Music+ program or simply load and execute each song file from this month's RAINBOW ON TAPE. Either way, you'll be musically entertained.*

The following contributors have sent us their compositions using the original *Music+* program. We have dumped the first portion of the music data from each song using *Music+*'s (H)dcopy command and have printed it for your enjoyment. Both songs will be provided in their entirety on this month's RAINBOW ON TAPE, immediately following the *Music+* program listing. Simply CLOADM and EXEC to play each song.

### Scott Joplin's "The Entertainer" By Bill Kast

The listing: ENTERTAIN

COL:	LEN	V1	V2	V3	V4
1:	16	,D6	,D5	,Ø	,Ø
2:	16	,E6	,E5	,Ø	,Ø
3:	16	,C6	,C5	,Ø	,Ø
4:	8	,A5	,A4	,Ø	,Ø
5:	16	,B5	,B4	,Ø	,Ø
6:	8	,G5	,G4	,Ø	,Ø
7:	16	,D5	,D4	,Ø	,Ø
8:	16	,E5	,E4	,Ø	,Ø
9:	16	,C5	,C4	,Ø	,Ø
10:	8	,A4	,A3	,Ø	,Ø
11:	16	,B4	,B3	,Ø	,Ø
12:	8	,G4	,G3	,Ø	,Ø
13:	16	,D4	,D3	,Ø	,Ø
14:	16	,E4	,E3	,Ø	,Ø
15:	16	,C4	,C3	,Ø	,Ø
16:	8	,A3	,A2	,Ø	,Ø
17:	16	,B3	,B2	,Ø	,Ø
18:	16	,A3	,A2	,Ø	,Ø

19:	16	,G3#	,G2#	,Ø	,Ø
20:	8	,G3	,G2	,Ø	,Ø
21:	8	,Ø	,Ø	,Ø	,Ø
22:	8	,G5	,D5	,B4	,G2
23:	16	,D4	,B3	,G3	,Ø
24:	16	,D4#	,B3	,G3	,Ø
25:	16	,E4	,C3	,Ø	,Ø
26:	16	,C5	,C3	,Ø	,Ø
27:	16	,C5	,C4	,G3	,E3
28:	16	,E4	,C4	,G3	,E3
29:	16	,C5	,G3	,G2	,Ø
30:	16	,C5	,G3	,G2	,Ø
31:	16	,E4	,C4	,A3#	,G3
32:	16	,C5	,C4	,A3#	,G3
33:	8	,C5	,F3	,F2	,Ø
34:	8	,C5	,C4	,A3	,Ø
35:	16	,C5	,Ø	,Ø	,E3
36:	16	,C6	,E5	,C5	,E3
37:	16	,D6	,F5	,C4	,G3
38:	16	,D6#	,F5#	,C4	,G3
39:	16	,E6	,G5	,E5	,G2
40:	16	,C6	,E5	,C5	,G2
41:	16	,D6	,F5	,C4	,G3
42:	16	,E6	,G5	,C4	,G3
43:	16	,E6	,G5	,E5	,G2
44:	16	,B5	,D5	,B4	,G2
45:	8	,D6	,F5	,B3	,G3
46:	8	,C6	,E5	,C5	,C3
47:	8	,C6	,E5	,C4	,G3
48:	8	,C6	,E5	,C4	,G3

### Handel's "Hallelujah Chorus" By Dave Greenfield

The listing: HALELUJA

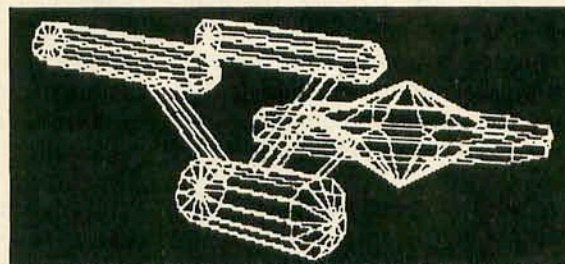
COL:	LEN	V1	V2	V3	V4
1:	8	,D5	,A4	,F4#	,D3
2:	8	,D5	,G4	,Ø	,E3
3:	8	,D5	,A4	,Ø	,F3#
4:	8	,A5	,F5#	,Ø	,D3
5:	8	,B5	,G5	,D5	,G3



6:	8	,A5	,F5#	,D5	,D3
7:	8	,Ø	,Ø	,Ø	,F3#
8:	8	,Ø	,Ø	,Ø	,A3
9:	8	,D6	,A5	,F5#	,D3
10:	8	,D6	,A5	,F5#	,E3
11:	8	,D6	,A5	,F5#	,F3#
12:	8	,F5#	,D5	,A4	,D3
13:	8	,G5	,C5#	,G4	,E3
14:	8	,F5#	,D5	,A4	,D3
15:	8	,Ø	,Ø	,Ø	,Ø
16:	8	,A5	,D5	,A4	,F3#
17:	8	,G5	,C5#	,A4	,E3
18:	8	,F5#	,D5	,A4	,D3
19:	8	,E5	,D5	,A4	,A3
20:	8	,E5	,C5#	,G4	,A2
21:	8	,D5	,A4	,F4#	,D3
22:	8	,A4	,Ø	,F4#	,D3
23:	8	,B4	,Ø	,G4	,Ø
24:	8	,C5#	,Ø	,E4	,Ø
25:	4.	,D5	,A4	,F4#	,D3
26:	8	,A4	,A4	,D4	,F3#
27:	8	,B4	,G4	,D4	,G3
28:	8	,A4	,F4#	,D4	,D3
29:	8	,Ø	,Ø	,Ø	,F3#
30:	8	,Ø	,Ø	,Ø	,A3
31:	4.	,D5	,A4	,F4#	,D3
32:	8	,A4	,A4	,D4	,F3#
33:	8	,B4	,G4	,D4	,G3
34:	8	,A4	,F4#	,D4	,D3
35:	8	,Ø	,Ø	,Ø	,Ø
36:	16	,D5	,A4	,D4	,F3#
37:	16	,D5	,A4	,D4	,F3#
38:	8	,D5	,B4	,G4	,G3
39:	16	,D5	,A4	,F4#	,D3
40:	16	,D5	,A4	,F4#	,Ø
41:	8	,D5	,B4	,G4	,Ø
42:	16	,D5	,A4	,D4	,F3#
43:	16	,D5	,A4	,D4	,F3#
44:	8	,D5	,B4	,G4	,G3
45:	16	,D5	,A4	,F4#	,D3
46:	16	,D5	,A4	,F4#	,Ø
47:	8	,D5	,B4	,G4	,D4
48:	8	,D5	,A4	,D4	,F3#
49:	8	,C5#	,G4	,E4	,E3
50:	8	,D5	,F4#	,A3	,D3
51:	8	,D5	,E4	,A3	,A3
52:	8	,C5#	,E4	,A3	,A2
53:	8	,D5	,F4#	,A3	,D3
54:	8	,A5	,D5	,A4	,F3#
55:	8	,G5	,C5#	,A4	,E3
56:	8	,F5#	,D5	,A4	,D3
57:	4.	,E5	,A4	,C4#	,A3
58:	8	,A4	,A4	,E4	,C4#
59:	8	,F5#	,A4	,D4	,D4
60:	8	,E5	,A4	,C4#	,A3
61:	8	,Ø	,Ø	,Ø	,C4#
62:	8	,Ø	,Ø	,Ø	,E4
63:	4.	,E5	,A4	,C4#	,A3

COL:	LEN	,V1	,V2	,V3	,V4
64:	8	,A4	,A4	,E4	,C4#
65:	8	,F5#	,A4	,D4	,D4
66:	8	,E5	,A4	,C4#	,A3
67:	8	,Ø	,Ø	,Ø	,Ø
68:	16	,E5	,A4	,E4	,C4#
69:	16	,E5	,A4	,E4	,C4#
70:	8	,F5#	,A4	,D4	,D4
71:	16	,E5	,A4	,C4#	,A3
72:	16	,E5	,A4	,C4#	,A3
73:	8	,Ø	,F4#	,D4	,A3
74:	16	,E5	,A4	,E4	,C4#
75:	16	,E5	,A4	,E4	,C4#
76:	8	,F5#	,A4	,D4	,D4
77:	16	,E5	,A4	,C4#	,A3
78:	16	,E5	,A4	,C4#	,A3
79:	8	,Ø	,F4#	,D4	,A3
80:	8	,E5	,A4	,E4	,C4#
81:	8	,F5#	,A4	,D4	,D4
82:	8	,E5	,A4	,E4	,C4#
83:	8	,D5	,A4	,F4#	,B3
84:	8	,D5	,G4#	,D4	,B3
85:	8	,C5#	,A4	,E4	,A3
86:	16	,Ø	,A4	,C4#	,E3
87:	16	,Ø	,A4	,C4#	,E3
88:	8	,Ø	,A4	,D4	,F3#
89:	8	,Ø	,A4	,C4#	,E3

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# Rejuvenate Father Time with a Chic Quartz-Locked Clock

By Henry C. Gernhardt, Jr.

**M**any years ago when I purchased my first computer I sorely felt the need for some sort of clock everytime DOS asked for the time and date. I solved the date problem with a calendar, but the cost of a quartz-locked board with battery backup was prohibitive. And all the clock circuits shown in computer and electronic magazines were very difficult to build.

Today, with computers that just a few years ago sold for several thousand dollars now selling for several hundred, it is possible to find quartz clock modules in many hobby shops. These black box modules are pre-wired, require no external circuitry and generally make use of widely available penlight cells that last for several years. They are even available with electronic gongs and chimes.

Construction begins with the hunt for parts. Locate either a five and one-quarter inch or eight-inch diskette. A

magnetic tape reel could be substituted, but you will have to use some ingenuity since nine-track computer tape is incompatible with most diskette machines (unless you have a tape transport mechanism).

Next, you need a piece of mat board, cardboard, or a thin piece of plywood or hardboard. Cut this piece into a square slightly smaller than the diskette. (See Figure 1.) Cut, punch or drill a three-eighths-inch hole in the exact center. This dimension is not critical, and a bit of play may even be beneficial.

Use some double-sided tape, contact cement or any kind of adhesive to affix the mat board to the backside of the diskette. I used double-sided tape to hold everything together while the silicon rubber glue (RTV) set up. This allows for quick assembly, yet provides a secure joining of the two pieces.

Make sure the hole in the mat board is centered in the middle of the diskette jacket hub hole. Then center the diskette itself, making sure all three holes are concentric. A dab of RTV will ensure they remain centered.

For the diskette clock assemblies, quartz clock modules with one-quarter inch or shorter mounting collars should be used, but longer collars are acceptable if you use appropriate spacers or are making a computer tapereel-based unit.

These marvelous little black boxes make use of both electronic and mechanical linkages and offer quartz-locked accuracy at an affordable price.

Mount the black box through the center hole from the back of the diskette assembly. Make sure the rubber gasket has been placed over the mounting collar. Put a brass washer and mounting nut over the collar from the front of the diskette and tighten. Mount the time indicators according to the directions that come with the module. Secure them with a cap nut, or an open nut if you plan to use a second indicator.

Viola! A handsome wall clock in the shape of a computer diskette. Various LCD and LED modules are also available. One of these can be mounted in the hub hole of a diskette or even in the head slot. For movements using electronic chimes, a thin box can be constructed in which to mount the chime, using the diskette as a lid.

I painted the second hands fluorescent orange, the hour hand red and the minute hand yellow to provide easily deciphered time. Dots, numerals and other kinds of markers for dial indicators are available from clock movement suppliers. I did not use dial indicators because I like the starkness of an unmodified and unmarked diskette with the orange second hand sweeping an

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*Henry Gernhardt lives in Huntington, West Virginia, and is the owner and operator of H and F Data Service. His company provides word processing, business graphics and data services to authors, students and local businesses.*



eternal path around a black background. My diskette clock draws many compliments.

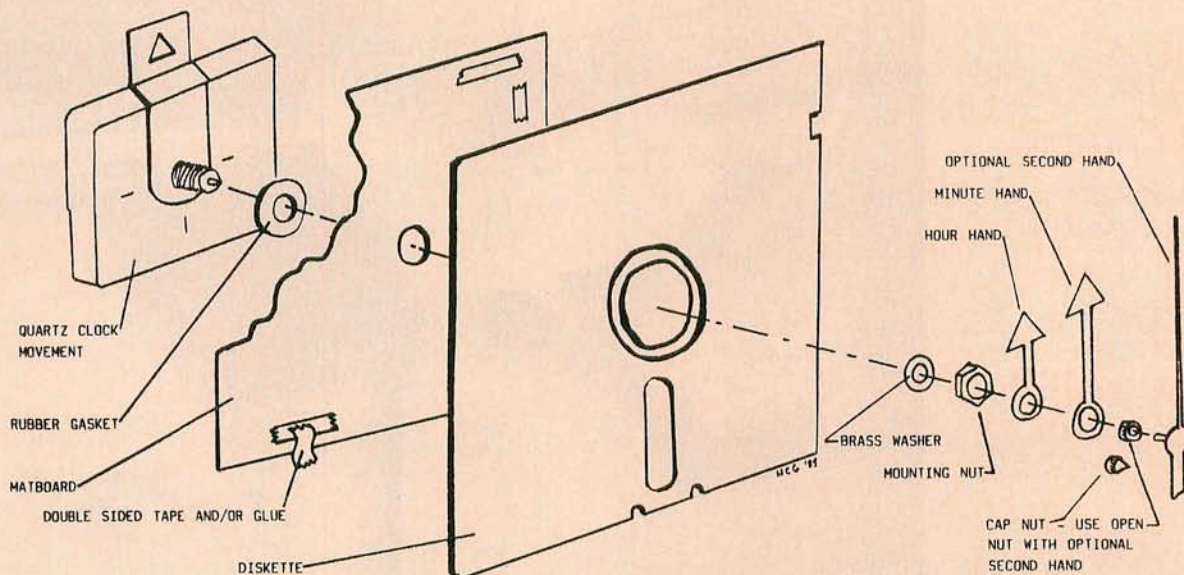
One supplier of quartz movements is

Klockit, P.O. Box 629, Highway H North, Lake Geneva, WI 53147.

(You may contact Mr. Gernhardt with questions about the quartz clock

construction at 926 Ninth St., Huntington, WV 25701, phone 304-697-4642. Please enclose an SASE when writing.)

Figure 1



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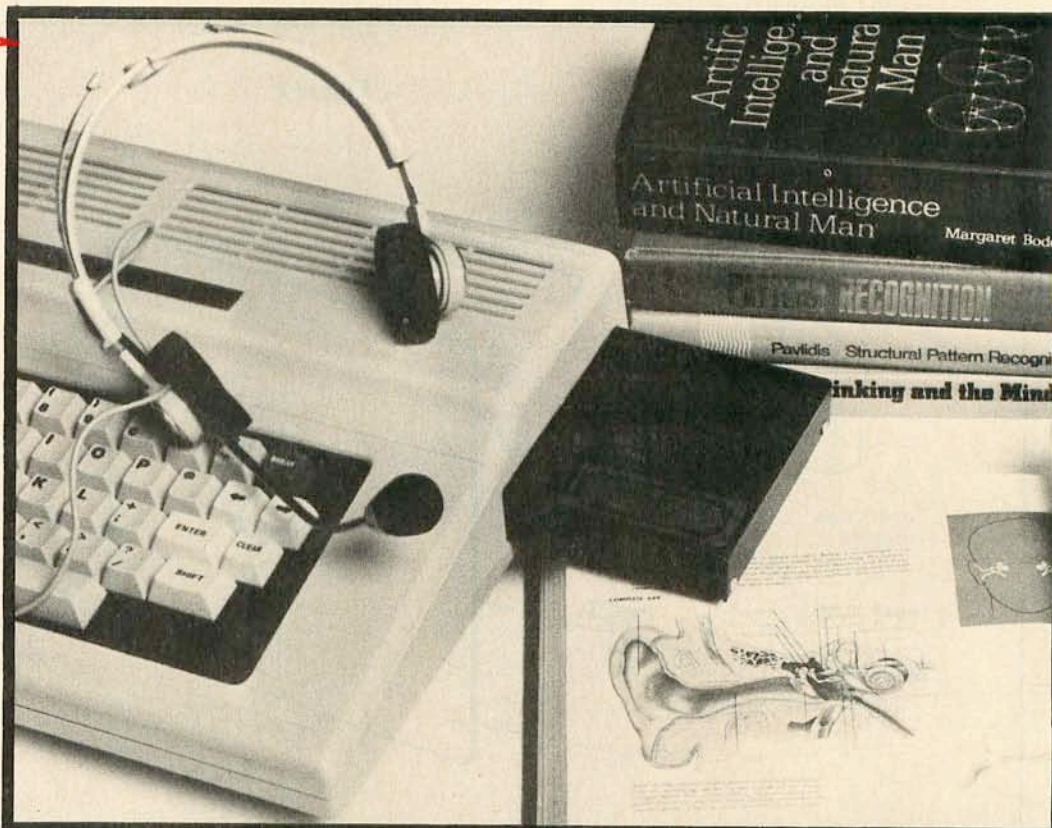
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**FEMALE and CHILDREN'S VOICES COMING SOON.** The technique we use is independent of the speaker. A male announcer is presently used, female and young people's voices coming soon.

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AGAIN	GET	OUT
ALL	GO	PASS
AND	HALF	PENNY
AT	HAVE	PLEASE
BUY	HOOR	QUARTER
CALL	IN	READY
CASE	IS	REACH
CENT	IT	RIGHT
CLEAR	LEAVE	SECOND
CLOSE	LEFT	SELECT
COMPUTER	LEVEL	SEND
CONNECT	LOVE	SET
DAY	MORE	START
DIAL	MULTIPLY	STOP
DOLLAR	NEAR	SOUTH
DOWN	NEED	THAN
DOOR	NEXT	THE
EAST	NICKEL	THIRD
END	NO	TIME
ENTER	NORTH	UP
FAST	NUMBER	WAIT
FASTER	OF	WEST
FIFTH	OFF	YES
FIRST	ON	YOU

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ADD	HELLO	PRESS
ASK	HELP	PLACE
ASSISTANCE	HERE	PLAY
AUTO	HOLD	POINT
BUT	INCORRECT	QUICK
COCO	INCREASE	RADIO
COMPLETE	JUST	RECEIVE
CONTINUE	KEY	RECORD
COPY	LESS	REPLACE
CORRECT	LESSER	REVERSE
COST	LIGHT	ROOM
DATE	LOWER	SERVICE
DECREASE	LOWEST	SIDE
DEPOSIT	MONEY	SLOW
DIME	MOVE	SLOWER
DIVIDE	NEAR	SPACE
DRIVE	NEED	STATION
ENTRY	NEXT	THANK YOU
EXIT	NOT	THIS
FLOOR	NOTICE	TOTAL
FORWARD	ONWARD	TRY
FROM	OPEN	TURN
GOING	OR	USE
GREAT	OVER	YOUR

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THREE	C	CHARLIE
FOUR	D	DELTA
FIVE	E	ECHO
SIX	F	FOXTROT
SEVEN	G	GOLF
EIGHT	H	HOTEL
NINE	I	INDIA
TEN	J	JULIETT
ELEVEN	K	KILO
TWELVE	L	LIMA
THIRTEEN	M	MIKE
FOURTEEN	N	NOVEMBER
FIFTEEN	O	OSCAR
SIXTEEN	P	PAPA
SEVENTEEN	Q	QUEBEC
EIGHTEEN	R	ROMEO
NINETEEN	S	SIERRA
TWENTY	T	TANGO
THIRTY	U	UNIFORM
FORTY	V	VICTOR
FIFTY	W	WHISKEY
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AMPERE	FLOW	MINUS
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BRAKE	FUEL	NORMAL
BUTTON	GALLON	OPERATOR
CANCEL	GAS	PER
CAUTION	GRAM	PERCENT
CENTIGRADE	HERTZ	PHASE
CHANGE	HIGH	POUND
CHECK	HIGHER	PRESSURE
CONTROL	INCHES	PULSE
CURRENT	INTRUDER	RANGE
DANGER	KILO	SAFE
DEGREE	LIMIT	SMOKE
DISK	LOAD	SPEED
EMERGENCY	LOCK	SWITCH
EQUAL	LOW	SYSTEM
ERROR	MEASURE	TEMPERATURE
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AIL	MEGA	WARNING
AILURE	METER	WEIGHT

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AMIE	GIRL	QUESTION
ANSWER	GIVE	RACHAEL
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AWAY	HORSE	SENTENCE
BEFORE	HOW	SINK
BOB	JOHN	SIT
BOX	LAURA	SIGN
BOY	LIKE	SOLVE
CAN	LINDA	SPELL
CAT	LISA	SQUARE
CHAIR	MAKE	SPRING
CHRIS	MEAGAN	SUBTRACT
CLASS	MEASURE	SUMMER
DAY	MISSING	TABLE
DECIMAL	MODIFY	TAKE
DESK	NAME	TEACHER
DIFFERENCE	NIGHT	TIM
DO	NOUN	TOM
DOG	PEOPLE	UNDER
DRINK	PERIOD	VERB
FALL	PHRASE	WOULD
FIND	PRODUCT	WINTER

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For those needing a custom vocabulary, Speech Systems offers customized speech libraries at the rate of \$15 per phrase (5 seconds max.), 10 phrases minimum order. Provide an audio cassette tape with phrases or use our announcer. . . . . Minimum \$150.00



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†Custom Library not part of introductory offer.



# SYMPHONY 12<sup>TM</sup>

## A 12 VOICE POLYPHONIC STEREO MUSIC SYNTHESIZER



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- 12 SIMULTANEOUS VOICES
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- 4 NOISE GENERATORS
- SOUND EFFECTS
- PLAYS AND MAKES MUSICA 2 FILES



**SUPER POLYPHONIC.** Speech Systems is proud to bring you SYMPHONY 12, a polyphonic 12 voice hardware stereo music synthesizer for the Color Computer. SYMPHONY 12 also gives you 4 noise generators for percussion synthesis and sound effects. The PIANO KEYBOARD and MUSICA 2 (sold separately) turns your COCO into a real music machine with incredible flexibility.

**STEREO and MONO.** By connecting SYMPHONY 12 to your home stereo system, music is produced in stereo, 6 voices from each channel. However, you don't need to have a stereo system, all 12 voices also come out of your TV or monitor.

**PICK AN INSTRUMENT.** SYMPHONY 12 lets you choose from 10 preset instruments to synthesize chimes, violin, oboe, banjo, harpsichord, piano and more. You can even change instruments as the music plays.

**SOUND EFFECTS.** SYMPHONY 12 is a sophisticated sound generator. 12 voices and 4 noise generators give you incredible sound effect capability. We have included gun shot, explosion, racing car and more.

**WATCH IT PLAY.** As SYMPHONY 12 plays, a graphics display of a piano keyboard shows the notes playing. The display is entertaining as well as very educational.

**PLAY MUSICA 2 FILES.** Thousands of MUSICA 2 users will be excited to know SYMPHONY 12 plays all music developed using MUSICA 2 like you have never Seen or Heard it. In fact we highly recommend the use of MUSICA 2 as a composition development tool for SYMPHONY 12. Use MUSICA 2's superior graphics input capability and then play it through SYMPHONY 12. You can also take advantage of our MUSIC LIBRARY series (sold separately) to give you access to over 500 music pieces representing 20 hours of music.

**ULTIMATE MUSIC DEVELOPMENT SYSTEM.** SYMPHONY 12, MUSICA 2, and the PIANO KEYBOARD give you incredible flexibility. Imagine sitting down at the PIANO KEYBOARD, playing a piece and recording it as you play just as you would to a tape recorder. Save your masterpiece and then using MUSICA 2 edit it if you like and print it. If you have a MIDI synthesizer, you can take the music and play it using COCO MIDI (sold separately). Try that on an IBM, APPLE, or COMMODORE (good luck).

**PIANO KEYBOARD.** For those wishing to turn SYMPHONY 12 into a real polyphonic synthesizer we offer the extremely powerful and versatile PIANO KEYBOARD. The PIANO KEYBOARD was designed to be used in our entire music product line. You can use it with SYMPHONY 12, MUSICA 2, SYNTH 77 PLUS, and even our advanced speech synthesizer, SUPER VOICE.

When using MUSICA 2, you will be using 4 of the 12 voices available from SYMPHONY 12. To take advantage of the full 12 voice capability of SYMPHONY 12 you may use either the Color Computer's keyboard or the PIANO KEYBOARD.

**Y-CABLE or MULTI-PAK.** Tape users using both SYMPHONY 12 and the PIANO KEYBOARD will require a Y-CABLE. Disk users will require the Triple Y-Cable or MULTI-PAK.

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- Supports up to 16 tracks.
- 2,000 events per track.
- 4,000 events all tracks.
- May be used as a sequencer.
- User friendly graphics display.
- Menu driven.
- Metronome available.
- Real time recording.
- Save your masterpiece to disk.
- Tempo may be modified.
- Quantizing to 32nd or 64th.



- Playback any or all tracks at any tempo.
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- Requires 64K disk system.
- Transposition.

our entry level MUSICA 2 COCO MIDI system that plays MUSICA files or our Professional COCO MIDI SYSTEM.

Comes complete with Rom Pak Hardware interface, cables, manual, and software. Disk users require Y-Cable or Multi-Pak . . . . . \$149.95

Now under development, voicing patch libraries for the Casio CZ series of synthesizers.

## CZ-101 USERS!

We offer the CZ-101 CONNECTION and the 61 NOTE PIANO KEYBOARD to turn the 101 into a professional full size synthesizer.

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61 NOTE KEYBOARD . \$129.95

## MUSICA MIDI™

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COCO MIDI includes: documentation, plenty of music, and the cable to connect between the COCO and your synthesizer. . . . . \$39.95 Tape or Disk

## MUSIC LIBRARY™

The MUSIC LIBRARY series consists of 8 volumes: 100 through 800 each sold separately. Each contains over 100 four voice music selections with a playing time of over 3 hours each. The disk version is shipped on 5 full disks. When coupled with the STEREO PAK, the music is reproduced with unsurpassed realism.

A JUKEBOX program is included to allow you to select specific songs or automatically play each. These songs are ready to go, you don't need MUSICA 2 or a knowledge of music. MUSICA 2 users may customize each song. Each volume sold separately, specify tape or disk. . . . \$29.95 Tape or Disk

### MUSIC LIBRARY 100

Stage, Screen, & TV  
Music of the 70's  
Music of the 60's  
Music of the 50's  
Old Time Favorites

Classical  
Christmas (popular)  
Christmas (traditional)  
Patriotic  
Polka Party

MUSIC LIBRARY 200 (another 100 selections)  
MUSIC LIBRARY 300 (another 100 selections)  
MUSIC LIBRARY 400 (another 100 selections)  
MUSIC LIBRARY 500 (another 100 selections)  
MUSIC LIBRARY 600 (another 100 selections)  
MUSIC LIBRARY 700 (another 100 selections)  
MUSIC LIBRARY 800 (another 100 selections)

**Entire Library**  
**30 Hours of**  
**Music!**  
**40 disks**  
**or**  
**25 tapes**

## SYNTH 77 PLUS

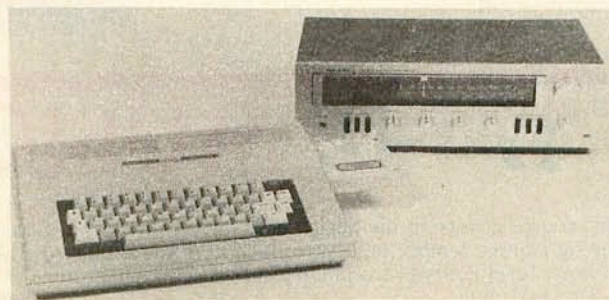
You control vibrato pattern, Bender rate, Volume level as well as Attack, Decay, Sustain, and Release (ADSR envelope). As you play you can record, then edit and save it to disk or tape. You can even fine tune it to match other instruments.

The PIANO KEYBOARD is not necessary, you can use your COCO keyboard but the PIANO KEYBOARD makes your COCO a real music instrument. . . . . \$29.95 Disk only

## STEREO PAK™

Plug this gem into your computer, connect to your home stereo system and sit back and enjoy music realism. The STEREO PAK is a hardware music synthesizer that plays our MUSIC LIBRARY series and MUSICA 2 music in stereo. Because it was designed specifically with music reproduction in mind, the sound is superb. The highs are crisp and clear while the bass notes will rattle your walls. Internally we use two high performance 8 bit digital to analog converters to assure fidelity.

The STEREO PAK is all hardware. It is intended as an enhancement for MUSICA 2 and our MUSIC LIBRARY series. Disk users will require our Y-CABLE or a MULTI-PAK. . . . . \$39.95





# NEW! 61 NOTE PIANO KEYBOARD



The PIANO KEYBOARD and **SYMPHONY 12** turns the COCO into a 12 voice music synthesizer. When used with **MUSICA 2**, the PIANO KEYBOARD provides a user-friendly means of inputting music. For those wishing control over Vibrato, Volume, Bender, as well as Attach, Decay, Sustain, and Release (ADSR), we offer **SYNTH 77 PLUS**, a monophonic synthesizer. **SUPER VOICE**, COCO's most advanced speech

Our new 61 note (5 octave) full size keyboard is perfect for the beginner or professional. To give the PIANO KEYBOARD the most flexibility, we give you a choice of 5 different products to use: **SYMPHONY 12**, **MUSICA 2**, **SYNTH 77 PLUS**, **SUPER VOICE**, and the **CZ-101 CONNECTION**.

synthesizer, doubles as a music synthesizer when used with the PIANO KEYBOARD. For those with the Casio CZ-101 music synthesizer, the **CZ-101 CONNECTION** allows you to connect the "full size" PIANO KEYBOARD to give you standard keyboard.

61 NOTE PIANO KEYBOARD ..... \$129.95  
CZ-101 CONNECTION ..... \$ 29.95

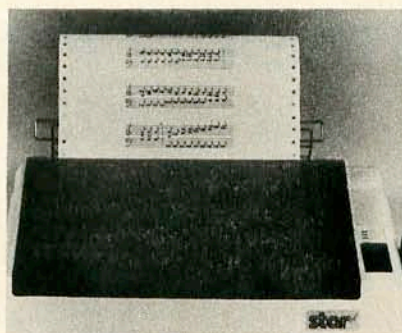
## MUSICA 2 \$29.95

Tape or Disk

- When in stereo mode, music is played through our STEREO PAK (purchased separately).
- Loudness of each voice may be individually specified.
- Memory available is constantly displayed.
- Voice waveshapes may be exchanged between voices at any point.
- Tempo may be specified and may even be altered as the music plays.
- Flats and sharps supported.
- Billions of timbre combinations.
- High resolution graphic display, looks just like sheet music.
- MUSICA 2 is 100% software, no need for hardware unless you want music produced in STEREO. In that case, the STEREO PAK may be purchased separately. It's a must for the audiophile!
- Repeat bars allow repeating of music without re-inserting music a second or third time.
- 30 page manual describes all.
- Requires 64K.



- Output music to your printer (Gemini 10X, Epson, R.S. printers).



- Allows you to specify key signature.
- Voice timbre (waveshape) may be altered by specifying harmonic content just like stops on an organ.
- During editing, voice being inserted is displayed.
- Each measure is numbered for easy reading of music.
- Measure bars aid in reading and developing music.
- Each voice may be visually highlighted for easy identification.
- 4 Voices produced simultaneously.
- Input notes from Coco keyboard, joystick, or Piano Keyboard.
- Play music from your own BASIC program.
- Block copy music for easy music development.
- 100% machine language so it is lightning fast.
- Vibrato effect easily produced.
- With STEREO PAK, voices may be switched between left and right speakers as music plays.
- Durations include: whole, half, quarter, eighth, sixteenth, thirty-second, sixty-fourth, and triplet.



### COURSE 1

## MUSIC THEORY



### COURSE 2

This course covers all the basics from music notation & duration, key signatures, tempo, to an introduction of the keyboard. This is an entry level course recommended as a prerequisite for Course 2. 32K Disk only ..... \$49.95

A more advanced course that deals with: Major and Harmonic Minor scales, interval spelling, Triad (Chord) theory, Inversions, Dominant 7th chords, and ear training of the intervals. 32K Disk only . \$49.95



# 'SUPER VOICE' T.M.

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**IT TALKS, SINGS AND  
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IT TALKS. A free TRANSLATOR text-to-speech program makes writing your own talking program as easy as SAYING "HELLO."

SUPER VOICE works in any 32K or 64K computer. A disk system requires a Y-Cable or Multi-Pak.

**Here are the facts;  
the decision is yours.**

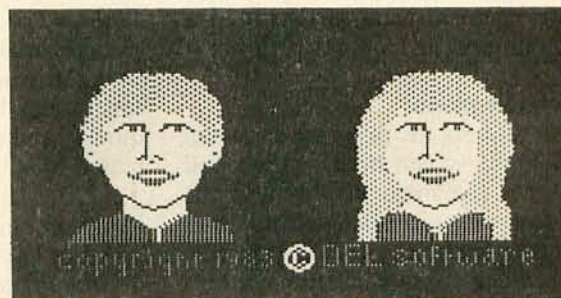


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**FREE  
SUPER TALKING HEADS**

Paul and Pauline, our talking heads program is normally \$24.95. Until May 15 we will include them with each SUPER VOICE order.

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Synthesizer Device	SSI-263	SC-01	SP-256	SC-01
Speaking Speeds	18	1	1	1
Volume Levels	18	1	1	1
Articulation Rates	8	1	1	1
Vocal Tract Filter Settings	255	1	1	1
Basic unit of Speech	44,100 samples/sec	64 phonemes	64 allophones 5 pause lengths	64 phonemes
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*Mix the PLAY command with Sound Processor and you'll have . . .*

# CoCo Instant Music

**By Dan Tandberg, M.D.**

**T**he PLAY command in Extended Color BASIC is a useful and powerful command for creating sound effects and music on the CoCo, but has always seemed difficult to use in actual practice. The string arguments for this command must be written in BASIC and then laboriously altered using the EDIT command. This trial-and-error procedure can be cumbersome. To overcome this and other problems, I have written a specialized text editor, *Sound Processor*, to facilitate creating and using strings for the PLAY command.

## Using the Program

When running the program shown in Listing 1, the screen briefly clears and then shows the main display and the first of four help screens. Pressing 'H' at any time brings up the next help screen. These screens contain all the symbols and commands in the *Sound Processor* program.

The display area on the top half of the screen contains the page number and

the length of the string on that page. To create a sound, type in the symbols wanted and they are displayed. For example, try:

```
T200;04;L40;V22;1;2;3;4;5;6;
```

To see how this sounds, press the space bar and this string will be executed using the PLAY command. (Review the section on the PLAY command in the Extended BASIC manual if this seems confusing.)

Small changes can easily be made in this string using the various features of *Sound Processor*. You can hear the changes quickly and conveniently before going on. In this way, sounds and music can be created and edited as quickly and easily as text can be manipulated on a word processor.

## Program Features

All of the features and functions of *Sound Processor* are displayed on the four help screens for easy reference during use. Press 'H' until the first help screen labeled SYMBOLS appears. This is a list of all the characters that can be entered into a string argument for the PLAY command.

Note that the program allows the use of either letters (A through G) or numbers (1 through 12) for notes. In addition, the plus (or '#') and minus signs are used for sharps and flats. The

length, tempo, pause, octave and volume parameters are listed with their allowable ranges. The other symbols, '<', '>' and '.', are also used in the standard fashion. Anytime you press one of these valid characters, it is added to the string at the cursor position.

Press 'H' again to see the second help screen labeled CURSOR. This shows all of the possible ways the cursor can be manipulated. The right- and left-arrow keys move the cursor one space forward or backward and, if shifted, move it 10 spaces in the appropriate direction. The up-arrow key moves the cursor to the very beginning of the string (home) while the down-arrow key moves it to the end of the page. The CLEAR key deletes the character just in front of the cursor.

*Sound Processor* can edit and test up to eight different strings at once, with each string displayed on a separate "page." The shifted up- and down-arrow keys are used to move forward and backward. (When first running the program, all eight pages are, of course, empty.)

The third help screen, labeled PLAY ROUTINES, shows the different ways the strings can be executed. The space bar, as mentioned, plays one repetition of the string on the page displayed. Pressing ENTER plays the displayed

*Dan Tandberg lives in Albuquerque where he teaches emergency medicine at the University of New Mexico.*



string several times in a row. Initially, the sound is played three times, but the repeat counter can be set to any number desired using the '\$' function. Finally, pressing the '@' key plays all the pages in rapid succession, beginning with page one and ending with page eight. These commands are especially helpful when writing music. Small sections can be developed separately and each tested using the space bar. The whole piece can then be played with '@'.

The last help screen contains the TRANSFER ROUTINES. These may seem a bit complicated, but are useful for moving strings or parts of strings around between pages. The '!' key extends a string by taking all the characters from the cursor to the end of the string and adding this substring onto the end of the string. This is especially helpful when you need to write a string with many repeated elements.

To see how this works, go to page two (use SHIFT-down arrow) and type in:

```
T4;L2;04;V25;EEFGGFEDCCDE;
L2.;E;LB.;D;L2;D;P2;
```

Now play it using the space bar. Move the cursor to the beginning of the page (up arrow). Press the '!' key and watch what happens. To complete the phrase, change the last three notes to 'D', 'C' and 'C'. You can use this extend function repeatedly until the string becomes too long. (Each page is limited to 240 characters).

The insert command (close parenthesis) actually inserts a blank page and moves each page above it up by one. Any data in page eight is lost, so be

careful. The delete command (open parenthesis) simply deletes a page and moves everything above it downward.

Pressing the '%' key allows you to exchange pages. For example, pages one and two can be swapped. The '&' key adds the page specified to the displayed page. The '=' key copies the displayed page to the page specified. You can also replicate a page with the apostrophe (') key. This makes a copy of the displayed page, inserts it into the next higher page and moves everything above upward. As with the insert command, the highest page is lost. Finally, pressing SHIFT and CLEAR together erases the entire displayed page, leaving all others intact.

Notice the message at the bottom of each help screen, IF ERROR OR BREAK USE GOTO 10. Whenever you make a syntax mistake in a string and try to play it, you'll get an error message (SN). If the program is run again, it erases all the strings already created. To avoid this, simply enter GOTO 10 and the program returns to where you were. Fix the error in the string and go on.

#### Input/Output Routines

Press 'I' at any time to bring up the I/O menu. This is used for saving or loading strings created to or from tape. Strings can be sent to the line printer as well by using option seven.

Perhaps the most useful I/O routines are three and four. These save either the displayed page or all eight pages to tape, but as DATA statements with line numbers. These files can be reloaded at

a later time and used in your own BASIC programs without retyping any of the data.

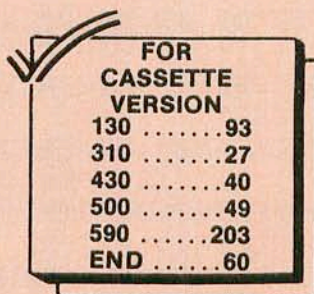
#### Modifications

*Sound Processor* can easily be modified to hold more pages of strings. Simply increase the value of 'Z' in Line 560 to suit your own needs. Also increase the amount of string space cleared in Line 20. Lines 650 and 660 may also be altered to produce DATA statements with different line numbers, if needed.

The *Sound Processor* can also be modified for disk operation by simply changing the device number in Line 670 and making minor changes in a few other lines. Substituting the lines shown in Listing 2 demonstrates one method of doing this.

I've found that using the *Sound Processor* markedly improves the utility of the PLAY command. Having all the information continuously available from the help screens is a real plus. Sound effects or music can be developed in a matter of minutes rather than hours. When a set of strings is finished, saving them as DATA lines using option four from the I/O menu produces a file that can be incorporated into one of your own BASIC programs. I would enjoy hearing about any modifications or unique applications.

(Questions about this program can be directed to Dr. Tandberg at 4130 Coe Drive NE, Albuquerque, NM 87110, phone 505-256-9457. Please enclose an SASE when writing.) □



FOR CASSETTE VERSION	
130	.....93
310	.....27
430	.....40
500	.....49
590	.....203
END	.....60

Listing 1: SOUND CAS

```
10 'SOUND PROCESSOR
   DAN TANDBERG, M.D.
   ALBUQUERQUE, NEW MEXICO
20 IFF=0 THEN CLEAR 4000:GOSUB 550
30 CLS:GOSUB 240
40 L=LEN(N$(I)):PRINT@0,"PAGE";I
   ;"OF";Z:PRINT@20,"LENGTH=";
50 PRINT@27,L,LEFT$(N$(I),C);CHR
```

```
$(207);RIGHT$(N$(I),L-C):GOSUB 100
0
60 N=INSTR(Q$,K$):IFN>23 THEN IF L
<X THEN N$(I)=LEFT$(N$(I),C)+K$+R
IGHT$(N$(I),L-C):C=C+1:L=L+1:GOT
O 50 ELSE GOTO 50
70 IFN>12 THEN PRINT@32,C$:PRINT@3
2,"";:ON N-12 GOSUB 250,270,290,3
00,310,330,360,370,390,410,430:P
RINT@32,C$:PRINT@32,"";ELSE ON N
   GOSUB 120,130,140,150,160,170,18
0,190,200,210,220,230
80 GOTO 40
90 'WAIT SUBROUTINE
100 K$=INKEY$:IF K$="" THEN 100 ELSE
RETURN
110 'MAIN SUBROUTINES
120 C=C-(C<L):RETURN
130 C=C+(C>0):RETURN
140 IFC<(L-9) THEN C=C+10:RETURNEL
SEC=L:RETURN
```



```

150 IFC>9THENC=C-10:RETURNELSEC=
0:RETURN
160 C=0:RETURN
170 C=L:RETURN
180 PLAYN$(I):RETURN
190 IFC>0THENN$(I)=LEFT$(N$(I),C
-1)+RIGHT$(N$(I),L-C):C=C-1:RETU
RNELSERETURN
200 FORK=1TOR:PLAYN$(I):NEXTK:RE
TURN
210 FORK=1TOZ:PLAYN$(K):NEXTK:RE
TURN
220 IFL+LEN(RIGHT$(N$(I),L-C))<=
X THENN$(I)=N$(I)+RIGHT$(N$(I),L
-C):C=C+LEN(RIGHT$(N$(I),L-C)):R
ETURNELSERETURN
230 H=H+1:IFH>3THENH=0
240 PRINT@288,H$(H):RETURN
250 IFI<Z THENI=I+1ELSEI=1
260 C=0:RETURN
270 IFI>1THENI=I-1ELSEI=Z
280 C=0:RETURN
290 PRINT"ERASE THIS PAGE? (Y/N
)":GOSUB100:IFK$<>"Y"THENRETURN
ELSEN$(I)="" :C=0:RETURN
300 PRINT"REPEAT COUNTER IS SET
TO";R:INPUT"ENTER NEW VALUE";R:I
FR<1THENR=1:RETURNELSERETURN
310 INPUT"PAGE TO APPEND";K:IFK>
Z OR K<1THENRETURN
320 IFLEN(N$(I)+N$(K))<X THENN$(
I)=N$(I)+N$(K):C=L:RETURNELSERET
URN
330 PRINT"REPLICATE THIS PAGE?
(Y/N)":GOSUB100
340 IFK$<>"Y"ORI=Z THENRETURN

```

```

350 FORK=Z-1TOI STEP-1:N$(K+1)=N
$(K):NEXTK:RETURN
360 PRINT"EXCHANGE THIS PAGE WIT
H PAGE #";:INPUTK:IFK<1ORK>Z THE
NRETURNELSEN$(0)=N$(I):N$(I)=N$(
K):N$(K)=N$(0):C=0:RETURN
370 PRINT"INSERT A BLANK PAGE?
(Y/N)":GOSUB100
380 IFK$<>"Y"ORI=Z THENRETURNELS
EFORK=Z-1TOI STEP-1:N$(K+1)=N$(K
):NEXTK:N$(I)="" :C=0:RETURN
390 PRINT"DELETE THIS PAGE? (Y/
N)":GOSUB100
400 IFK$<>"Y"THENRETURNELSEIFI=Z
THENN$(I)="" :C=0:RETURNELSEFORK
=I TO Z-1:N$(K)=N$(K+1):NEXTK:N$(
Z)="" :C=0:RETURN
410 PRINT"COPY PAGE";I;"TO PAGE
#";:INPUTK:IFK<1ORK>Z THENRETURN
ELSEN$(K)=N$(I):C=0:RETURN
420 'I/O ROUTINES
430 CLS:PRINT" I/O ROUTINES:",
STRING$(32,208);"0 EXIT I/O MEN
U","1 SAVE PAGE","2 SAVE ALL
PAGES","3 SAVE PAGE (DATA)"
440 PRINT"4 SAVE ALL PAGES (DAT
A)","5 LOAD PAGE","6 LOAD ALL
PAGES","7 LPRINT ALL PAGES","8
SAVE MAIN PROGRAM":GOSUB100
450 CLS:N=INSTR(M$,K$):IFN=0THEN
GOSUB240:RETURN
460 ON N GOSUB470,480,490,500,51
0,520,530,540:GOTO430
470 PRINT"SAVE PAGE";I:INPUT"CAS
SETTE READY TO RECORD? FILE
NAME";K$:PRINT "SAVING PAGE";I:
OPEN"O",#D,K$:PRINT#D,N$(I):PRIN
TN$(I):CLOSE#D:RETURN
480 PRINT"SAVE ALL PAGES":INPUT
"CASSETTE READY TO RECORD?
FILENAME";K$:PRINT "SAVING PAGE
S";I;"TO";Z:OPEN"O",#D,K$:FORK=1
TOZ:PRINT#D,N$(K):PRINTN$(K):NEX
TK:CLOSE#D:RETURN
490 PRINT"SAVE PAGE (DATA)";I:IN
PUT"CASSETTE READY TO RECORD?
FILENAME";K$:PRINT"SAVING PA
GE";I;"(DATA)":OPEN"O",#D,K$:K$=
STR$(Q)+" DATA "+N$(I):PRINT#D,K
$:PRINTK$:CLOSE#D:RETURN
500 PRINT"SAVE PAGES (DATA)":QQ
=Q:INPUT"CASSETTE READY TO RECOR
D? FILENAME";K$:PRINT"SAVI
NG ALL PAGES (DATA)";I:OPEN"O",#
D,K$:FORK=1TOZ:K$=STR$(QQ)+" DAT
A "+N$(K):PRINT#D,K$:PRINTK$:QQ=
QQ+A:NEXTK:CLOSE#D:RETURN

```

### Two-Liner Contest Winner . . .

This little routine is great as a stand-alone or it could be incorporated into most any home written education program. Alter it to suit your needs.

#### The listing:

```

10 CLS:PRINT@160,"I WILL TEACH Y
OU YOUR MULTIPLICATION
TABLES.":INPUT"WHICH TABLE(1-12
)":M:CLS:Y=RND(12):PRINT@200,"WH
AT IS"M*"Y":INPUT A:IF A=M*Y T
HENPRINT"CORRECT":FOR P=1TO460*5
:NEXT:GOTO10
20 CLS:PRINT@205,"WRONG":FOR P=1
TO460*5:NEXT:GOTO10

```

Mary Hooper  
Waterford, Ontario

(For this winning two-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape*.)



```

510 PRINT"LOAD PAGE:";I:INPUT"CA
SSETTE READY TO PLAYBACK? FI
LENAME";K$:PRINT"LOADING PAGE";I
:OPEN"I",#D,K$:INPUT#D,N$(I):PRI
NTN$(I):CLOSE#D:RETURN
520 PRINT"LOAD ALL PAGES:";INPUT
"CASSETTE READY TO PLAYBACK?
FILENAME";K$:PRINT"LOADING PAGE
S";1;"TO";Z:OPEN "I",#D,K$:FORK=
1TOZ:INPUT#D,N$(K):PRINTN$(I):NE
XTK:CLOSE#D:RETURN
530 PRINT"LINEPRINTING ALL PAGES
":INPUT"PRINTER ON";K$:IFK$<>"Y"
THENRETURNELSEFORK=1TOZ:PRINTN$(
K):PRINT#-2,N$(K):PRINT#-2:NEXTK
:RETURN
540 PRINT"SAVING MAIN PROGRAM:";
CSAVE"SP":RETURN
550 'INITIALIZATION
560 Z=8:DIMN$(Z):'# OF PAGES
570 X=240:'MAX PAGE LENGTH
580 C$=STRING$(X,32):'BLANK
590 DIMH$(3):FORH=0TO3:READH$(H)
:H$(H)=H$(H)+LEFT$(C$,192-LEN(H$
(H)))+>>IF ERROR OR BREAK USE G
OTO 100:NEXTH:H=0:'HELP SCREENS
600 Q$=CHR$(9)+CHR$(8)+CHR$(93)+
CHR$(21)+CHR$(94)+CHR$(10)+CHR$(
32)+CHR$(12)+CHR$(13)+"@!H"+CHR$(
91)+CHR$(95)+CHR$(92)+"$&%"(=I
ABCDEFGH1234567890#+-.<>;OLTVP":'
MAIN STRING
610 M$="12345678":'I/O STRING
620 C=0:'CURSOR POSITION
630 I=1:'PAGE POINTER
640 R=3:'REPEAT COUNTER
650 Q=9000:'DATA LINE #
660 A=10:'LINE # INCREMENT
670 D=-1:'DEVICE #
680 F=1:'RESTART FLAG SET
690 RETURN
700 DATA"SYMBOLS:          LENGTH
L1-L255          TEMPO
T1-T255  ABCDEFG      PAUSE
P1-P255  1; - 12;      OCTAVE
O1-O5    #+-.<>;        VOLUME
V1-V31"
710 DATA"CURSOR:          (SHIF
TED)    <- LEFT      <- LEFT
TEN     -> RIGHT      -> RIGH
T TEN   UP HOME       UP LAST
PAGE    DN END        DN LAST
PAGE    (CLEAR TO DELETE)
720 DATA"PLAY ROUTINES:
SPACE   PLAY THIS PAGE
ENTER   PLAY WITH REPE
AT       @   PLAY ALL PAGES
          $   CHANGE REPEAT
COUNTER"

```

```

730 DATA"TRANSFER ROUTINES:
! EXTEND      ) INSERT
T PAGE        % EXCHANGE    ( DELET
E PAGE        ' REPLICATE    = COPY
PAGE          & APPEND      I I/O M
ENU           (SHIFT/CLEAR TO ERASE
PAGE)"
740 END

```

## Listing 2: SOUNDISK

```

10 'CHANGES FOR DISK OPERATION
440 PRINT"4 SAVE ALL PAGES (DAT
A)","5 LOAD PAGE",,"6 LOAD ALL
PAGES","7 LPRINT ALL PAGES","8
SAVE MAIN PROGRAM","9 DIRECTO
RY":GOSUB100
460 ON N GOSUB470,480,490,500,51
0,520,530,540,545:GOTO430
470 PRINT"SAVE PAGE";I:INPUT"FIL
ENAME";K$:PRINT "SAVING PAGE";I:
OPEN"O",#D,K$:PRINT#D,N$(I):PRIN
TN$(I):CLOSE#D:RETURN
480 PRINT"SAVE ALL PAGES:";INPUT
"FILENAME";K$:PRINT "SAVING PAGE
S";1;"TO";Z:OPEN"O",#D,K$:FORK=1
TOZ:PRINT#D,N$(K):PRINTN$(K):NEX
TK:CLOSE#D:RETURN
490 PRINT"SAVE PAGE (DATA)";I:IN
PUT"FILENAME";K$:PRINT"SAVING PA
GE";I;"(DATA)":OPEN"O",#D,K$:K$=
STR$(Q)+" DATA "+N$(I):PRINT#D,K
$:PRINTK$:CLOSE#D:RETURN
500 PRINT"SAVE PAGES (DATA)":QQ
=Q:INPUT"FILENAME";K$:PRINT"SAVI
NG ALL PAGES (DATA)";I:OPEN"O",#
D,K$:FORK=1TOZ:K$=STR$(QQ)+" DAT
A "+N$(K):PRINT#D,K$:PRINTK$:QQ=
QQ+A:NEXTK:CLOSE#D:RETURN
510 PRINT"LOAD PAGE:";I:DIR:INPU
T"FILENAME";K$:PRINT"LOADING PAG
E";I:OPEN"I",#D,K$:INPUT#D,N$(I)
:PRINTN$(I):CLOSE#D:RETURN
520 PRINT"LOAD ALL PAGES:";DIR:I
NPUT"FILENAME";K$:PRINT"LOADING
PAGES";1;"TO";Z:OPEN "I",#D,K$:F
ORK=1TOZ:INPUT#D,N$(K):PRINTN$(I
):NEXTK:CLOSE#D:RETURN
530 PRINT"LINEPRINTING ALL PAGES
":INPUT"PRINTER ON";K$:IFK$<>"Y"
THENRETURNELSEFORK=1TOZ:PRINTN$(
K):PRINT#-2,N$(K):PRINT#-2:NEXTK
:RETURN
540 PRINT"SAVING MAIN PROGRAM:";
SAVE"SP":RETURN
545 DIR:GOTO100
610 M$="123456789":'I/O STRING
670 D=1:'DEVICE #

```



# CoCo Dares You to Name That Tune

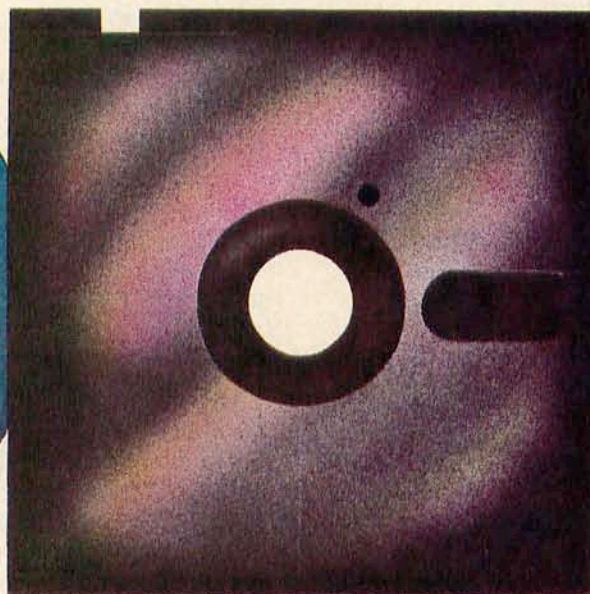
By Marge Rutter

**W**e've all watched those people on TV winning the big bucks just for naming a couple of tunes. And haven't you, at least once, thought to yourself, "I can do that"? But could you? Under all that pressure? Are you really quicker than the other guy?

Here's your chance to see! *Name That Song* challenges two players with all that pressure in the comfort of your own home.

Listing 1 loads 48 songs, with their titles and clues about their identity, into disk files. The titles are camouflaged so typing in the program won't reveal any answers. Most songs are not listed in their entirety but enough is there to recognize the tune. Type in and run Listing 1. When it is finished, the files are loaded for future use. Listing 1 doesn't have to be run again.

Listing 2 is the game. Here, two players, joysticks in hand, can battle it out against each other. Keep in mind that the computer is doing many different things between each note, so the joysticks are not very sensitive. A quick press does not necessarily register. The key is to push the firebutton and hold it down until the song stops. If the joysticks don't have any effect on the song, you



*Marge Rutter is currently studying to become a computer science teacher and holds a bachelor's degree in education/foreign languages. She lives in Phoenixville, Pennsylvania with her husband, two children and Color Computer.*



need to change lines 5110, 5120 and 5135. The numbers 126 and 125 should be substituted for the numbers 254 and 253, respectively. Apparently, some CoCos produce one set of these numbers when the firebutton is pressed and others produce the other set.

Each song plays for only 30 seconds before the computer goes on to another song. If you want more time, increase the timer in Line 5125.

When the song is stopped, the computer allows time for the player to announce the answer verbally, before giving the correct answer. The players decide whether the answer will be accepted or not.

If the players decide to set a time limit and one of them takes too long, simply mark that answer as wrong, so there will be no point given.

Finally, since the songs are selected randomly some of them could easily be played two or more times during the course of the game.

However, flags are set on songs that have been played and each new song is checked to make sure it hasn't been played before. Occasionally, the program appears to lock up when it's trying to find a new song. If this happens, relax. Think of it as a commercial and it will be right back.

The game is divided into five parts:

**Melody Roulette** — Melody Roulette starts out with a spinning wheel to determine how much money you are playing for. The best out of five songs wins this part. A tiebreaker is played if necessary.

**Tune Topics** — The 48 songs are divided into six categories. One of these categories is randomly chosen and the five songs are selected from that category. Once again, the best out of five wins and tiebreakers are played in the event of a tie.

This is the one area in which the program could lock up permanently. In the unlikely event that too many songs from the chosen category were already played during Melody Roulette (leaving less than five songs to choose from) or if too many tiebreakers empty out the category, the program goes into an endless loop, searching for a song in the category when one doesn't exist. Just press BREAK and start over.

**Bid-a-Note** — On TV, if the player who bids can't name the song correctly, the other player gets the point. This has never seemed fair to me. So in my version of the game, I've made it impossible to win Bid-a-Note by default. If you don't bid, you don't win.

There is nothing in the program to prevent a player from bidding higher than the previous bid. Similarly, there is nothing to stop the first player from passing on the first bid. If the first player does pass the first time around, the second player gets the bid for 15 notes. Again, the best out of five wins.

**Tiebreaker** — Melody Roulette and Tune Topics are each worth 10 game points. Bid-a-Note is worth 20. So, it is possible to have a tie at the end of the first three parts. A simple, sudden death tiebreaker decides who goes on to the Golden Medley.

**Golden Medley** — Now one of the players is on his own and the pressure is really on. He has 30 seconds to name five songs. The timer runs only while the music is playing. Press the firebutton (using the right joystick) to stop the timer for the answer. Or, if not sure, pass and come back to it afterwards. Remember, one wrong answer ends the game! If you need reminders on how to play, there are optional directions before each section.

(Questions about this program may be directed to the author at 48 Kenalcon Drive, Phoenixville, PA 19460, phone 215-933-8612. Please enclose an SASE when writing.) ☐

260 .....84	1430 .....243
550 .....79	1530 .....97
630 .....105	1620 .....222
710 .....80	1740 .....114
790 .....239	1880 .....45
900 .....60	2010 .....150
1000 .....171	3025 .....175
1090 .....105	3100 .....104
1210 .....110	3165 .....227
1310 .....101	END .....175

#### Listing 1: SONGS

```
10 OPEN "D", #1, "SONGS/DAT", 3
15 FIELD#1,3 AS NO$
20 FOR X=200 TO 9600 STEP 200
30 Z=X
```

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```

40 FOR C=1 TO 2
50 READ S$
60 RSET NO$=S$
70 PUT#1,Z
80 Z=Z+1
90 IF S$="P20" THEN C=2 ELSE C=1
100 NEXT C
110 NEXT X
120 CLOSE#1
130 OPEN"O",#2,"TITLES/DAT"
140 FOR X=1 TO 6
150 READ CA$
160 WRITE#2,CA$
170 FOR Y=1 TO 8
180 READ NO
190 FOR Z=1 TO NO
200 READ CH
210 A$=A$+CHR$(CH)
220 NEXT Z
230 WRITE #2,A$
235 A$=""
240 NEXT Y
250 NEXT X
260 CLOSE#2
300 OPEN"D",#1,"CLUES/DAT",100
310 FOR X=1 TO 48
320 READ CL$
330 WRITE#1,CL$
340 PUT#1,X
350 NEXT X
360 CLOSE#1
500 DATA T2,L8,O3,G,E,L4,G,L8,G,
E,L4,G,L8,A,G,F,E,D,E,L4,F,L16,E
,F,L8,G,C,L16,C,C,L8,C,L16,C,D,E
,F,L4,G,L8,G,D,D,F,E,D,L4,C,P20
510 DATAT2,O2,L4,G,L8,G,G,L4,G,L
8,G,G,L4,B,L8,O3,D,D,O2,B,B,L4,G
,A,L8,A,L4,A,L8,A,A,L4,F#,L8,A,A
,F#,F#,L4,D
520 DATAL8,G,G,G,G,L4,G,L8,G,G,L
4,B,L8,O3,D,D,O2,B,B,G,L3,O3,D,L
8,C,C,O2,B,A,A,L2,G,P20
530 DATAT3,O3,L2,G,L4,E,L2,C,L6,
C,L8,D,L4,E,L2,G,L4,E,L2,C,G,L4,
E,L2,C,L4,D,E,L2,F#,G,A,L4,G,L8,
A,L4,A#,A,G,L4,E,D,D,L8,E,L4,F,E
,L8,D,G,G,G,P20
540 DATAT3,O3,L4,C,L8,C,L4,C,L8,
D,L4,E,E,L8,E,L4,D,L8,C,L4,D,L8,
E,L2,C,L4,E,E,L8,F,L4,G,G,F,L8,E
,L4,F,L8,G,L4,E,P20
550 DATAT4,O3,L4,C,C,C,L2,D,L4,D
,E,G,E,L2,C,O2,L4,G,O3,L2,C,L4,C
,L2,D,L4,D,L2,E,L3,C,L4,O2,G,O3,
L2,C,L4,C,L2,D,L4,D,E,G,E,L2,C,L
4,A,P18,L4,D,F,L2,E,C,P20
560 DATAT3,O3,L4,G,L8,G,L4,E,L8,
A,L3,G,E,L4,G,L8,G,L4,E,L8,A,L3,
G,E,G,E,G,L4,E,L8,G,L3,G,G,O4,C,
P20
570 DATAT2,O3,L8,E,D,C,D,E,E,L4,
E,L8,D,D,L4,D,L8,E,G,L4,G,L8,E,D
,C,D,E,E,L4,E,L8,E,D,D,E,D,L2,C,
P20
580 DATAT2,O3,L4,C,C,G,G,A,A,L2,
G,L4,F,F,E,E,L8,D,D,D,D,L2,C,L4,
G,G,F,F,E,E,L2,D,L4,G,G,F,F,E,E,
L2,D
590 DATAL4,C,C,G,G,A,A,L2,G,L4,F
,F,E,E,D,D,L1,C,P20
600 DATAT2,L4,O4,C,L8,C,C,C,L4.,
C,P8,O3,L8,A#,O4,D,O3,A#,L4,O4,C
,L8,D,O3,A#,O4,C,L4.,C,P4,O3,L4,
A,L8,A#,O4,C,L2,D,C,P8,L8,D,O3,A
#,G,L4,F,L8,F,E,L2,D,L4,C,P20
610 DATAT2,L8,O4,D#,L4,C,L16,C,O
3,A#,O4,C,O3,A#,L8,O4,C,O3,G,L16
,O4,C,O3,A#,L8,O4,C,C,L16,C,O3,A
#,O4,C,C,L8,D#,C,O3,G
620 DATAP8,O4,D#,L4,C,L16,C,O3,A
#,O4,C,O3,A#,L8,O4,C,O3,G,L16,O4
,C,O3,A#,O4,C,O3,A#,L8.,O4,C,L16
,C,D#,C,C,O3,A#,O4,L8,C,O3,G,P20
630 DATAT2,O3,L4,A,G,A,O4,C,D,L8
,O3,G,L4,G,L8,F,L4,G,G,L8,F,G,L4
,A,F,G,L8,C,L4,C,L8,C,L4,C,L8,C,
L4,C,L8,C,L4,C
640 DATAA,G,A,O4,C,D,L8,O3,G,L4,
G,L8,F,L4,G,G,L8,F,G,L4,A,F,G,L8
,C,L4,C,L8,C,L4,C,L8,C,L4,C,L8,C
,L4,C,P20
650 DATAT2,L2.,O3,G,L4,O4,D,L2,C
,L4.,O3,B,L8,A,G,F,L2,G,L4,C,L4.
,B,L8,A,G,F,L2,G,L4,C,L2.,D
660 DATAL4,E,L2.,C,L4,G,L4.,E,L8
,D,L2.,C,L4,G,L4.,E,L8,D,L4,C,E,
G,L8,O4,C,L3,O3,B,L8,A,B,L3,A,L8
,G,L2.,A,P20
670 DATAT2,L8,O3,A,B,A,G,L2,A,P4
,L8,A,B,A,G,G,L1,E,P4,L8,O4,C,C,
C,C,C,L2,C,P4,L8,C,C,C,L4,C,L1,O
3,B,P20
680 DATAT2,L4,O3,G,L8,F,L3,F,P6,
L8,A,B,O4,C#,D,E,F,L6,E,L16,D,L2
,D
690 DATAL8,D,D,C,O3,A#,A,G,L4,A#
,L8,A,L4,A,G,F,L8,A,L4,G,L8,D,L4
,F,L8,A,L3,A,P20
700 DATAT2,O3,L2,A,G,L8,G,A,O4,C
,O3,B,A,G,L1,E,L8,D,E,G,E,G#,E,L
2,B,A,L16,D,E,L4.,D,L8,C,L1,E
710 DATAL8,C,E,L2,A,G,L8,G,A,O4,

```



C, O3, B, A, G, L1, E, L8, D, E, G, E, G#, E,  
L2, B, A, L16, D, E, L4., D, L8, C, L1, E, P  
20

720 DATAT4, O3, L4, G, A, G, F, E, F, L2,  
G, L4, D, E, L2, F, L4, E, F, L2, G, L4, G, A  
, G, F, E, F, L2, G, D, G, L4, E, L3, C, P20

730 DATAT2, L8, O3, F#, L4, F#, L8, G, L  
4, A, A, L8, G, L4, G, P6, L8, G, L4, G, L8,  
A, B, L4, B, L2., A, L8, F#, F#, F#, E, L4,  
D, L8, E, D, L2., C, L8, O2, B, B, L4, O3, D  
, E, E, L2., D, P20

740 DATAT2, L8, O3, C, D, F, F, O4, C, O3  
, L2., A, L8, A#, O4, L1, C, L4, E, D, C, O3  
, L4., A, L8, G, L2, F, L8, F, O4, E, F, F, D  
, C, L4., O3, A, L8, A#, L2, G, L8, C, D, F,  
F, O4, C, O3, L1, A, P20

750 DATAT1, L8, O3, E, D, F, L16, E, L4,  
E, L8, E, D, F, L16, E, L4, E, L8, E, D, F, L  
16, E, L4, E, L8, D, C#, E, L16, D, L4, D, L  
8, D, C#, E, L16, D, L4, D, L8, C

760 DATA02, B, O3, D, L16, C, L4, C, L8,  
O2, B, A, O3, C, L16, O2, B, L4, B, L8, B, A  
, O3, C, L16, O2, B, L4, B, P20

770 DATAT2, L2, O2, B, L4, O3, D#, E, L3  
, F#, L4, D#, O2, B, L2, O3, G, L4, F#, E, L  
2, B, P25, L4, B, L2, O4, C, L4, O3, B, A, L  
2, B, L4, A, G, L2, F#, L4, G, F#, L2, E, P2  
0

780 DATAT2, L8, O3, G, L3, G, L8, G, L3.  
, G, P8, L8, G, L4, O4, C, O3, C, L8, D#, L4  
, F, L2., F, L8, O3, G, L3, G, L8, G, L3, G,  
P4, L8, G, L4, G, G, A, B, L8, O4, C, L4, D#  
, D#, P20

790 DATAT3, O3, L8, E, G, L4, G, G, E, A,  
L2, G, L8, D, E, G, L4, G, G, A, L2, E, L8, E  
, L4, F, F, L8, F, L4., G, L4, A, G, L8, E, L  
4, D, L8, C, L1, C, L8, C, E, L4., G, L8, G,  
G, L4, G, A, L2, G

800 DATAL8, C, D, L4, E, L8, D, L4, D, L8  
, C, L2, D, L8, C, L4, F, L8, F, L4, F, F, A,  
L8, A, L4, A, O4, C, O3, L8, A, L2, G, P20

820 DATAT2, O3, L8, A, A#, L4., O4, C, L  
8, C, L4, C, L8, C, L4., C, O3, L8, A#, L4,  
A, L8, A#, O4, C, L4, C, O3, A#, A, L2., F,  
L8, F, L4, A#, A#, L8, A, L4, F, L2., C

830 DATAL8, C, L4, C#, C#, F, L8, O4, C,  
O3, F, L2., G, L8, A, A#, L4., O4, C, L8, C  
, L4, C, L8, C, L4., C, L8, O3, A#, L4, A, L  
8, A#, L4, O4, C, L8, C, C, O3, A#, A, A, L2  
, F, P20

850 DATA T3, O3, L2, E, L4, E, L8, B, L2  
, B, L8, B, L4., F#, L8, G, L4, F#, L1, E, L  
4, B, O4, D, L2, E, L4, D, O3, B, O4, C#, O3  
, A, L1, B

860 DATA04, L4, E, L2, E, L4, E, L2, D, L  
4, O3, B, B, A, G, L8, F#, L1, D, L2, E, L4,  
B, L2, A, L4, G, F#, E, D, L1, E, P20

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 3,A,L8,G,L3,A,P15,F,L8,F,A#,L4,O  
 4,C,D,P15,L8,D,L4,D,L8,D,L4,D#,L  
 3,C,L8,O3,A#,L2,O4,C,P20  
 900 DATAT2,L16,O3,G,L8.,G,L16,E,  
 L2,G,L8,E,L4.,C,L16,G,L8,A,L4,G,  
 L16,G,L8.,G,L16,E,L4,F,F,L8,D,L4  
 .,O2,B,L16,O3,G,L8,A,L4,G,L16,G,  
 L8.,G,L16,E,L2,G,L8,E,L4.,C,L16,  
 G,L8,A,L4,G  
 910 DATAL16,G,L8.,G,L16,G,L4,G,G  
 ,F,D,L2,C,P20  
 930 DATAT3,L4,O4,C,C,C,D,D,O3,B,  
 A,L2.,G,O4,L4,C,C,C,F,F,E,C,D,L8  
 ,E,D,L2.,C,L4,C,C,C,D,D,O3,B,A,L  
 2.,G,O4,L4,C,C,C,F,F,E,C,D,L8,E,  
 D,L2.,C,P20  
 950 DATAT3,L4,O3,E,F,L2.,G,L8,A,  
 G,A,L2.,G,L4,G,G,A,G,F,E,D,L2.,E  
 ,L8,F,E,F,L2.,E,L4,E,E,F,E,D,C,O  
 2,B,O3,L2.,C,L8,D,C,O2,B,L2.,O3,  
 C,L2,C,L8,D,C,D,L4,C,L2.,A,L1,O4  
 ,C,P20  
 970 DATAT2,L8,O3,E,G,A,O4,C,O3,B  
 ,A,L2,A,L8,E,G,A,O4,C,O3,B,A,L2,  
 A,L8,A,A,O4,C,E,D,E,L4,E,L8,O3,A  
 ,O4,D,C,O3,A,G,A,L4,A,L8,O4,C,D,

L4,C,L8,O3,A,G,A,L2,A,P20  
 990 DATAT2,O4,L2,C,O3,L8,B,O4,C,  
 L4,D,C,O3,L4.,B,L8,F#,L2.,G#,L4,  
 O4,E,L2.,D,L2.,O3,A,L8,F,G,L4,G#  
 ,A#,A#,O4,C,L2.,C  
 1000 DATAC,O3,L8,B,O4,C,L4,D,C,O  
 3,L4.,B,L8,F#,L2.,G#,O4,L4,E,L2.  
 ,D,O3,A,L8,F,G,L4,G#,A#,A#,O4,C,  
 L2.,C  
 1010 DATAP8,L2,C,C,L8,G,G,G,G,L4  
 ,G,L8,G,F,E,L4,D,L8,C,O3,B,O4,L2  
 ,C,C,P20  
 1030 DATAT2,O4,L8,D,C,C,O3,A,O4,  
 L4,C,O3,L8,A,O4,L4,C,O3,L4.,A,P3  
 0,O4,L8,D,D,C,L4,C,L8,C,L2.,O3,A  
 1040 DATAO4,L8,D,D,C,O3,A,A,F,G,  
 F,G#,L4,G,F,L8,F,F,L4,A,L8,G,F,G  
 ,F,D,L2,F,L8,F,F,G#,G#,G,F,G,G,L  
 4,F,L2.,F  
 1050 DATAL8,D,C,L2.,A,L8,G,E,L2,  
 F,O4,L2,C,O3,L8,A,A#,G,A#,A,L4,F  
 ,A,L8,O4,C,C,D,C,O3,A,F,G,L4,G,L  
 2,F,L4,A,L8,G,F,G,L4,G,L2,F,P20  
 1070 DATAT2,L8,O3,G,L4.,A,O4,L4,  
 C,O3,L8,B,L4,G,D,L8,E,E,L4,G,A,G  
 ,O4,C,O3,L8,B,L4,G,D,E,L8,G,L4.,  
 A,L8,G,L4,O4,C,L8,O3,B,L4,A,G,O4  
 ,C,O3,L8,B,L4,A,G,L2,A  
 1080 DATAL8,G,L4,A,O4,C,L8,O3,B,  
 L4,G,L8,D,D,L4,E,L8,G,L4,A,G,O4,  
 C,O3,B,L8,G,D,L4,D,L8,E,E,G,L4,A  
 ,L8,G,O4,L4,C,O3,B,A,G,O4,C,O3,B  
 ,G,B,A  
 1090 DATAO4,D,L2,D,L4,O3,B,B,O4,  
 C,O3,L8,B,L4.,G,L4,O4,D,L8,C,O3,  
 L4,B,O4,D,C,L8,O3,B,L4.,G,O4,L4,  
 D,L8,C,O3,L4,B,O4,D,L8,C,L4.,O3,  
 B,L4,A,L8,G,L4.,A,P20  
 1110 DATAT2,L4,O3,F,L8,G,L4,A,G,  
 L8,A,A#,L4,A,G,F,G,L8,A,L4,G,F,L  
 8,A,L2,G  
 1120 DATAO4,L4,C,L8,O3,A,L4,G,A,  
 O4,L8,C,O3,A#,L4,A,G,F,L8,G,A,L4  
 ,G,F,L8,A,L2,G,P20  
 1140 DATAT1,L8,O2,G,L4.,O3,C,L8,  
 G,L4.,F,L8,C,D#,F,L8.,D,L16,O2,A  
 #,L4.,O3,C,L8,G,L4.,A#,L8,A,A#,O  
 4,C,L8.,O3,A,L16,F,L2,G  
 1150 DATAL8,G,A#,O4,D,L8.,C,L16,  
 O3,G,L4,G,L8,O4,C,O3,G,O4,C,L8.,  
 D,L16,O3,G,L2,G,L8,F,G,G#,A#,L8.  
 ,G,L16,D#,L8,F,G,L8.,D#,L16,C,L2  
 .,D,P20  
 1170 DATAT4,L1,O3,G,L2.,G,L4,F#,  
 G,L2.,A,L4,G,L2,A,L4,G,A,L2,G,L4  
 ,F#,L1,F,A,L2.,A,L4,G#,A,L2.,B,L  
 4,A,L2,B,L4,A,B,L2,A,L4,G#,L1,G,  
 P20  
 1190 DATAT2,O3,L4,D,E,C#,P22,C,D

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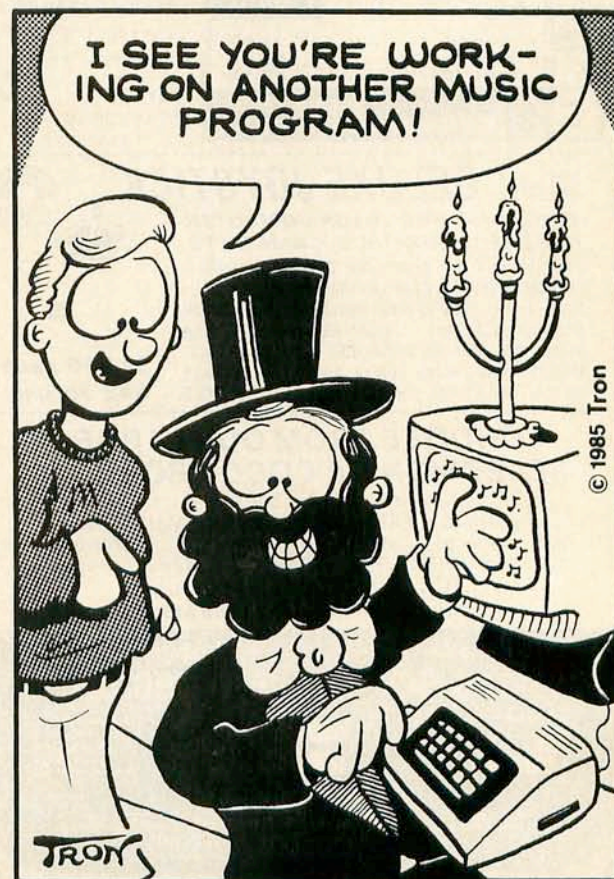


,O2,B,P22,L8,O3,D,E,L4,C#,L8,C,C  
 ,D,O2,B,P22,O3,D,D,D,E,C#,C#,C#,  
 E,C,L4,C,O2,B  
 1200 DATAO3,L8,C,O2,B,O3,C,O2,B,  
 O3,C,O2,B,O3,C,O2,B,O3,C,O2,B,L4  
 ,O3,C,C,P22,L16,O2,B,L8,O3,D,D,C  
 #,L4,C#,P22,L8,O2,A,O3,C,D,O2,L1  
 6,B,A,L4,G,L8,O3,D,E,L4,C#,L8,C,  
 L4,D,O2,B  
 1210 DATAO3,L8,D,D,D,E,C#,C#,C#,  
 O2,A,P22,L16,A,O3,C,L8,D,O2,B,P2  
 2,O3,C,O2,B,O3,C,O2,B,O3,C,O2,B,  
 O3,C,O2,B,O3,C,O2,B,O3,C,O2,B,L4  
 ,O3,C,P20  
 1230 DATAT3,O3,L16,D#,L8,E,L16,G  
 ,L8,A,O4,L4,C,O3,B,A,G#,G,G#,A,P  
 22,L8,G,G,L4,G#,A,A#,B,P22,O4,C,  
 O3,B,A,G#,G,G#,A,P22,L8,G,G,L4,G  
 #,A,B,O4,C,P20  
 1250 DATAT2,O4,L2,C,O3,G,L8,G,L4  
 ,A,L8,G,F,L2,E,C,L8,G,L4,A,L8,G,  
 A,L2,B,L3,G,L8,E,L4,F,L8,F,F,E,L  
 4,D,L2,C,P20  
 1270 DATAT2,L8,O3,C,F,G,L2,A,L8,  
 A,G,F,L2.,A,L8,A,A#,O4,C,L2.,O3,  
 A#,L8,A#,F,L2.,G,O2,L8,A#,O4,L2.  
 ,C,L8,D#,C,O3,G#,L2.,A#  
 1280 DATAL8,A#,A#,A#,L2.,A,L8,D,  
 E,F#,G,A,L2.,B,L8,B,L2.,A#,L8,D#  
 ,F,G,G#,A#,O4,L4,C,L4.,O3,G,O4,L  
 8,E,D,C,O3,L4.,A#,A,L8,A,L2.,F,L  
 8,F,L4,G,L8,E,L2.,F,P20  
 1300 DATAT2,O3,L4,C,L8,D,L4,E,L8  
 ,C,L4,E,C,L2,E,L4,D,L8,E,F,F,E,D  
 ,L2,F,L4,E,L8,F,L4,G,L8,E,L4,G,E  
 ,L2,G,L4,F,L8,G,A,A,G,F,L2,A  
 1310 DATAL4,G,L8,C,D,E,F,G,L2,A,  
 L4,A,L8,D,E,F,G,A,L2,B,L4,B,L8,E  
 ,F,G,A,B,L2,O4,C,L4,C,L8,O3,B,L4  
 ,A,F,B,G,O4,L2,C,O3,L8,C,D,E,F,G  
 ,A,B,O4,L4,C,P20  
 1330 DATAT2,O4,L4,C,O3,A,F,C,L8,  
 D,E,F,L4,D,L6,F,L4,C,G,O4,C,O3,A  
 ,F,L8,D,E,F,L4,G,L6,A,L4,G  
 1340 DATAA,L8,A#,A,G,L4,O4,C,O3,  
 A,L8,G,L4,F,G,L3,A,L8,F,L4,D,L8,  
 F,D,L4,C,C,F,L8,A,L4,G,L8,C,L4,F  
 ,L8,A,L4,G,L8,A,A#,O4,C,O3,A,F,L  
 4,G,L8,C,L3,F,P20  
 1360 DATAT2,L4,O3,G,A,L4,B,L8,G,  
 L2.,E,L4,A,L8,F#,L2.,D,L4,G,L8,E  
 ,L4,C,G,E,L8,C,L4,E,G,L4,F#,L2,D  
 1370 DATAL8,G,A,L4,B,L8,G,L2.,E,  
 L4,A,L8,F#,L2.,D,L4,G,L8,E,L4,C,  
 G,E,L8,C,L4,E,G,L1,G,P20  
 1390 DATAT2,L8,O2,B,O3,C,L16,D,L  
 8.,D,L8,D,L16,E,L6,D,L16,C,L8,O2  
 ,B,O3,C,D,D,D,L16,E,L8,G,P8,G,A,  
 B,A,G,L16,E,L8,B,A,G,L16,G,L8,E,

L4,D

1400 DATAL16,O2,B,L8.,O3,C,L16,D  
 ,L8.,D,L8,D,L16,E,L6,D,L16,C,L8,  
 O2,B,O3,C,D,D,D,L16,E,L8,G,P8,G,  
 A,B,A,G,L16,G,L8,B,G,G,A,L2,A,P2  
 0  
 1420 DATAT2,O3,L2.,F,O4,C,L4.,D,  
 L8,C,O3,L4,A#,O4,L2.,C,O3,L8,F,F  
 ,L4.,F,L8,D,L4,F,D,L2,C,L8,A,O4,  
 C,L2,D,L8,C,O3,A,O4,L2,C  
 1430 DATAO3,L8,A,F,L4,G,L4.,F,L8  
 ,D,L2.,F,L8,G,A,F,F,L4,F,L2,F,L2  
 .,F,P20  
 1450 DATAT2,O3,L8,C,D,F,D,L4,A,C  
 ,L2,C,L8,C,D,F,D,L4,A,C,L2,C,L8,  
 A#,A,A,G,L4.,G,L8,D,A#,L4,A,L8,A  
 #,A,L4.,G  
 1460 DATAL8,A#,A,A,A,L4.,G,L8,C,  
 A#,L4,O4,C,O3,A,L8,G,P8,C,D,F,D,  
 L4,A,C,L2,C,L8,C,D,F,D,L4,A,C,L2  
 ,C  
 1470 DATAL8,A#,A,A,G,L4.,G,L8,D,  
 L4,A#,L8,A,L4,A,G,L8,D,A#,O4,C,O  
 3,A#,A,L4.,G,L8,C,A#,A,G,L4,A#,L  
 8,O4,C,O3,A,A,L4,G,F,P20  
 1490 DATAT2,O3,L4,D,E,L2,B,L4,A,  
 G,L2,E,L4,D,E,L2,B,L4,A,D,L2,B,L  
 4,D,L8,E,D,L4,F#,L8,E,L4.,F#,L8,

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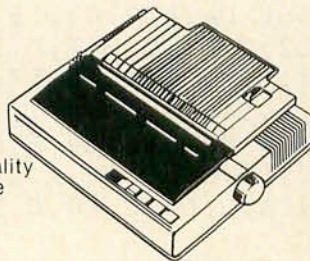


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L4, F#, L8, F, F, F, F, L4, G, A, L1, E, L4,  
G, L8, A, G, L4, B, L8, A, L2, B, L8, B, B, B,  
B, L4, O4, C, D, D, L8, O3, B, L2, B  
1510 DATAL8, B, B, B, B, L4, O4, C, D, O3  
B, L8, A, L2, G, L8, B, B, B, B, L4, O4, C,  
D, L1, O3, G, P20  
1530 DATAT2, O3, L2, A, L4., F, L8, A, A  
#, A, G, L4., A, L8, A, A#, A, G, L4, A, L8,  
G, F, L4, G, L16, E, D, L2, C, L8, A, O4, C,  
L2, D, L4., C, O3, L8, A, A#, A, G, L4, A, L  
8, A, A#, A, G, L4, A, L8, G, F, L2, E, P20  
1550 DATAT2, L2, O3, G, L8, A, B, O4, C,  
O3, B, O4, C, O3, L4, B, L8, A, L4, B, L8, O  
4, C, O3, B, O4, C, O3, L4, A, L8, A, B, O4,  
L2, C, O3, L8, E, G#, L8, B, O4, L4., C, L4  
., E, O3, L8, B, L4., B, O4, L16, C, O3, B,  
L4, A  
1560 DATAL4., G, L16, A, G, L4., F#, L2  
G, L8, A, B, O4, C, O3, B, O4, C, O3, L4, B  
L8, A, L4, B, O4, L8, C, O3, B, O4, C, L4,  
O3, A, L8, B, O4, C, L8, O3, B, O4, C, L4, O  
3, A  
1570 DATAP8, L8, G, A, A#, A, A, L4, A, L  
8, G, A, A#, O4, L4, G, D, L8, C, O3, A#, L4  
., A#, O4, C, L8, O3, A#, A, L4., A, L8, D,  
B, G, L4., G, P20  
1580 DATA "CHILDREN'S TUNES"  
1590 DATA 12, 84, 72, 73, 83, 32, 79, 7  
6, 68, 32, 77, 65, 78  
1600 DATA 42, 79, 78, 69, 32, 76, 73, 8  
4, 84, 76, 69, 32, 84, 87, 79, 32, 76, 73,  
84, 84, 76, 69, 32, 84, 72, 82, 69, 69, 32  
76, 73, 84, 84, 76, 69, 32, 73, 78, 68, 7  
3, 65, 78, 83  
1610 DATA 18, 83, 69, 83, 65, 77, 69, 3  
2, 83, 84, 82, 69, 69, 84, 32, 83, 79, 78,  
71  
1620 DATA 17, 73, 84, 90, 89, 32, 66, 7  
3, 84, 83, 89, 32, 83, 80, 73, 68, 69, 82  
1630 DATA 19, 80, 79, 80, 32, 71, 79, 6  
9, 83, 32, 84, 72, 69, 32, 87, 69, 65, 83,  
69, 76  
1640 DATA 21, 82, 73, 78, 71, 32, 65, 8  
2, 79, 85, 78, 68, 32, 84, 72, 69, 32, 82,  
79, 83, 73, 69  
1650 DATA 22, 77, 65, 82, 89, 32, 72, 6  
5, 68, 32, 65, 32, 76, 73, 84, 84, 76, 69,  
32, 76, 65, 77, 66  
1660 DATA 27, 84, 87, 73, 78, 75, 76, 6  
9, 32, 84, 87, 73, 78, 75, 76, 69, 32, 76,  
73, 84, 84, 76, 69, 32, 83, 84, 65, 82  
1670 DATA "ANOTHER TIME... ANOTHER  
PLACE"  
1680 DATA 12, 71, 85, 65, 78, 84, 65, 7



8,65,77,69,82,65  
 1690 DATA 18,83,85,77,77,69,82,3  
 2,73,78,32,84,72,69,32,67,73,84,  
 89  
 1700 DATA 31,68,79,32,89,79,85,3  
 2,75,78,79,87,32,84,72,69,32,87,  
 65,89,32,84,79,32,83,65,78,32,74,  
 79,83,69  
 1710 DATA 10,77,79,79,78,32,82,7  
 3,86,69,82  
 1720 DATA 18,67,65,76,73,70,79,8  
 2,78,73,65,32,68,82,69,65,77,73,  
 78  
 1730 DATA 9,89,69,83,84,69,82,68  
 ,65,89  
 1740 DATA 15,84,72,69,32,87,65,8  
 9,32,87,69,32,87,69,82,69  
 1750 DATA 14,76,79,78,68,79,78,3  
 2,66,82,73,68,71,69,83  
 1760 DATA "LOVE SONGS"  
 1770 DATA 21,73,70,32,73,32,87,6  
 9,82,69,32,65,32,67,65,82,80,69,  
 78,84,69,82  
 1780 DATA 21,87,69,39,86,69,32,7  
 9,78,76,89,32,74,85,83,84,32,66,  
 69,71,85,78  
 1790 DATA 15,84,72,69,32,87,65,8  
 9,32,79,70,32,76,79,86,69

1800 DATA 16,65,78,78,73,86,69,8  
 2,83,65,82,89,32,83,79,78,71  
 1810 DATA 26,84,72,73,83,32,71,8  
 5,89,83,32,73,78,32,76,79,86,69,  
 32,87,73,84,72,32,89,79,85  
 1820 DATA 19,73,32,72,79,78,69,8  
 3,84,76,89,32,76,79,86,69,32,89,  
 79,85  
 1830 DATA 2,73,70  
 1840 DATA 16,83,67,65,82,66,79,8  
 2,79,85,71,72,32,70,65,73,82  
 1850 DATA "AS THE WORLD TURNS"  
 1860 DATA 14,85,80,32,85,80,32,6  
 5,78,68,32,65,87,65,89  
 1870 DATA 37,72,69,39,83,32,71,7  
 9,84,32,84,72,69,32,87,72,79,76,  
 69,32,87,79,82,76,68,32,73,78,32  
 ,72,73,83,32,72,65,78,68,83  
 1880 DATA 31,89,79,85,32,65,82,6  
 9,32,84,72,69,32,83,85,78,83,72,  
 73,78,69,32,79,70,32,77,89,32,76  
 ,73,70,69  
 1890 DATA 28,89,79,85,32,65,78,6  
 8,32,77,69,32,65,71,65,73,78,83,  
 84,32,84,72,69,32,87,79,82,76,68  
 1900 DATA 17,65,73,78,39,84,32,7  
 8,79,32,83,85,78,83,72,73,78,69  
 1910 DATA 22,84,72,69,32,65,73,8



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2,32,84,72,65,84,32,73,32,66,82,  
69,65,84,72,69  
1920 DATA 16,74,79,89,32,84,79,3  
2,84,72,69,32,87,79,82,76,68  
1930 DATA 14,79,78,32,65,32,74,6  
9,84,32,80,76,65,78,69  
1940 DATA "OLD FAVORITES"  
1950 DATA 23,84,72,69,32,76,73,7  
9,78,32,83,76,69,69,80,83,32,84,  
79,78,73,71,72,84  
1960 DATA 6,69,88,79,68,85,83  
1970 DATA 17,66,69,69,82,32,66,6  
5,82,82,69,76,32,80,79,76,75,65  
1980 DATA 14,83,80,73,78,78,73,7  
8,71,32,87,72,69,69,76  
1990 DATA 9,65,76,76,69,89,32,67,  
65,84  
2000 DATA 9,66,79,82,78,32,70,82  
,69,69  
2010 DATA 15,67,79,76,79,85,82,3  
2,77,89,32,87,79,82,76,68  
2020 DATA 9,68,79,32,65,32,68,69  
,65,82  
2030 DATA "WOMEN"  
2040 DATA 5,68,65,73,83,89  
2050 DATA 21,72,69,89,32,84,72,6  
9,82,69,32,76,79,78,69,76,89,32,  
71,73,82,76  
2060 DATA 10,73,32,65,77,32,87,7  
9,77,65,78  
2070 DATA 4,74,69,65,78  
2080 DATA 5,77,65,78,68,89  
2090 DATA 15,77,89,32,67,72,69,8  
2,73,69,32,65,77,79,85,82  
2100 DATA 7,67,69,67,73,76,73,65  
2110 DATA 23,84,72,69,32,77,79,8  
3,84,32,66,69,65,85,84,73,70,85,  
76,32,71,73,82,76  
3000 DATA "A CHILDREN'S COUNTING  
AND RHYMING SONG"  
3005 DATA "YOU CAN'T SING THIS IF  
YOU CAN'T COUNT TO 10"  
3010 DATA "THEME SONG OF A POPULA  
R TV SHOW"  
3015 DATA "LET YOUR FINGERS DO TH  
E WALKING..."  
3020 DATA "THE MONKEY INITIATES T  
HE CHASE"  
3025 DATA "IT MAY NOT MAKE SENSE.  
..BUT ALL THE KIDS LIKE IT"  
3030 DATA "THIS SONG TELLS OF A V  
ERY DEVOTED PET"  
3035 DATA "I WONDER WHERE THIS SO  
NG CAME FROM"  
3040 DATA "A 1960'S TUNE ADAPTED  
FROM A SPANISH SONG BY JOSE MART  
I"  
3045 DATA "WORDS AND MUSIC BY JOH

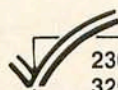
N SEBASTIAN, STEVE BOONE AND MAR  
K SEBASTIAN"  
3050 DATA "A DIONNE WARWICK HIT O  
F THE 60'S"  
3055 DATA "ANDY WILLIAMS EARNED A  
GOLD RECORD WITH THIS ONE IN 19  
61"  
3060 DATA "RECORDED BY THE MAMAS  
AND PAPAS ON DUNHILL RECORDS"  
3065 DATA "WORDS AND MUSIC BY JOH  
N LENNON AND PAUL MCCARTNEY"  
3070 DATA "FROM THE COLUMBIA PICT  
URE OF THE SAME NAME"  
3075 DATA "WE ALL HAVE TO FALL SO  
METIME"  
3080 DATA "WORDS AND MUSIC BY TIM  
HARDIN"  
3085 DATA "A 170 CARPENTERS HIT"  
3090 DATA "MUSIC BY JACK DIEVAL"  
3095 DATA "FROM 'THE JOLSON STORY  
'"  
3100 DATA "SUNG AND MADE FAMOUS B  
Y HERB ALBERT ON HIS 1968 TV SPE  
CIAL"  
3105 DATA "YOU CAN BE SURE I'M TE  
LLING THE TRUTH IN THIS SONG"  
3110 DATA "LET ME KNOW IF THIS SO  
NG BY JOHN ROSTILL SOUNDS FAMILI  
AR"  
3115 DATA "ADAPTED BY PAUL SIMON  
AND ART GARFUNKEL"  
3120 DATA "A FIFTH DIMENSION HIT  
OF THE 60'S"  
3125 DATA "ADAPTED BY GEOFF LOVE"  
3130 DATA "WORDS AND MUSIC BY STE  
VIE WONDER"  
3135 DATA "A HELEN REDDY HIT"  
3140 DATA "WORDS AND MUSIC BY BIL  
L WITHERS"  
3145 DATA "WORDS AND MUSIC BY ALB  
ERT HAMMOND AND MIKE HAZLEWOOD"  
3150 DATA "THREE DOG NIGHT'S 1971  
HIT"  
3155 DATA "PETER, PAUL AND MARY R  
ECORDED THIS TUNE BY JOHN DENVER  
IN 1969"  
3160 DATA "BASED ON A SONG BY SOL  
OMON LINDA AND PAUL CAMPBELL"  
3165 DATA "FROM THE MOVIE OF THE  
SAME NAME"  
3170 DATA "THE OKTOBERFEST WOULDN  
'T BE THE SAME WITHOUT THIS ONE"  
3175 DATA "WORDS AND MUSIC BY DAV  
ID C. THOMAS"  
3180 DATA "WHAT'S A WEDDING WITHO  
UT THIS SONG?"  
3185 DATA "COLUMBIA PICTURES AND  
CARL FOREMAN PRESENT..."



```

3190 DATA"FROM 'THE BALLET FOR A
      GIRL IN BUCHANNON'"
3195 DATA"FROM 'SOUND OF MUSIC'"
3200 DATA"THIS USED TO BE A STYL
      ISH TUNE"
3205 DATA"WORDS AND MUSIC BY EAR
      L SHUMAN AND LEON CARR"
3210 DATA"A HELEN REDDY HIT"
3215 DATA"FROM THE 20TH CENTURY-
      FOX FILM 'THE PRIME OF MISS JEAN
      BRODIE'"
3220 DATA"BARRY MANIOWS FIRST H
      IT SONG"
3225 DATA"WORDS AND MUSIC BY STE
      VIE WONDER, HENRY COSBY AND SYLV
      IA MOY"
3230 DATA"WORDS AND MUSIC BY PAU
      L SIMON"
3235 DATA"WORDS AND MUSIC BY NOR
      RIS WILSON, BILLY SHERRIL AND RO
      RY BOURKE"

```



230	.....251	3110	.....39
325	.....157	4080	.....32
550	.....66	6000	.....255
631	.....56	6100	.....5
830	.....145	7055	.....153
950	.....194	8080	.....148
1130	.....172	10025	.....97
1301	.....150	10205	.....200
1400	.....133	10325	.....243
2020	.....88	END	.....114

Listing 2: SONGGAME

```

99 CLEAR 5000:PCLEAR 2
100 DIM SPOT(75)
101 CLS
102 W=1
103 PRINT@73,"NAME THAT SONG"
104 PRINT@367,"BY"
105 PRINT@426,"MARGE RUTTER"
106 GOSUB 3030
110 'LOAD ARRAYS
120 OPEN "I",#1,"TITLES/DAT"
130 FOR X=1 TO 6
140 INPUT#1,CA$(X)
150 FOR Y=1 TO 8
160 INPUT#1,SO$(X,Y)
170 NEXT Y
180 NEXT X
190 CLOSE#1
200 OPEN"D",#1,"SONGS/DAT",3
201 DIM NO$(200)
205 DIM ST$(48)
206 ST=0

210 CLS
211 PRINT@41,"NAME THAT SONG"
212 PRINT@73,STRING$(14,45)
215 PRINT@162,"PLAYER#1'S NAME";
220 INPUT P1$
223 PRINT@258,"PLAYER#2'S NAME";
225 INPUT P2$
230 'MELODY ROULETTE
235 'PICK PLAYING AMOUNT
240 CLS
241 PRINT@352,STRING$(32,45)
242 PRINT@96,STRING$(32,45)
243 PRINT@232,"MELODY ROULETTE"
244 PRINT@292,"INSTRUCTIONS? <Y>
      OR <N>"
245 I$=INKEY$
246 IF I$<>"Y" AND I$<>"N" THEN
      GOTO 245
247 IF I$="Y" THEN GOSUB 100000
250 SPOT(1)=100
255 SPOT(2)=250
260 SPOT(3)=500
265 SPOT(4)=750
270 SPOT(5)=100
275 SPOT(6)=250
280 SPOT(7)=500
285 SPOT(8)=750
286 Y=225
290 FOR X=1 TO RND(20)+8
291 Y=Y-1
292 SOUND Y,1
295 CLS
300 PRINT@352,STRING$(32,45)
305 PRINT@96,STRING$(32,45)
310 PRINT@143,CHR$(133)
315 PRINT@173,SPOT(X)
320 PRINT@202,SPOT(X+7)
325 PRINT@232,SPOT(X+6)
330 PRINT@266,SPOT(X+5)
335 PRINT@301,SPOT(X+4)
340 PRINT@272,SPOT(X+3)
345 PRINT@242,SPOT(X+2)
350 PRINT@208,SPOT(X+1)
355 SPOT(X+8)=SPOT(X)
360 FOR Z=1 TO (15*X):NEXT Z
365 NEXT X
370 MONEY=SPOT(X-1)
375 PRINT@388,"WE'RE PLAYING FOR
      $";MONEY
390 FOR Z=1 TO 500:NEXT Z
400 'PLAY MELODY ROULETTE
410 FOR A=1 TO 2
420 'SELECT RANDOM TUNE
430 TUNE=TUNE+1
440 X=RND(6)
450 GOSUB 40000
460 R=((X-1)*8+Y)*200
465 GOSUB 30000

```



```

470 GOSUB 5000
480 IF C=0 THEN GOSUB 6000 ELSE
CLS:PRINT@261,"TIMES UP...NEXT T
UNE":FOR W=1 TO 500:NEXT W:A=1
530 IF TUNE>=5 AND P1<>P2 THEN A
=2
540 NEXT A
550 IF P1>P2 THEN PL$=P1$ ELSE P
L$=P2$
560 CLS:PRINT@45,PL$
561 PRINT@102,"WINS MELODY ROULE
TTE,"
563 PRINT@169,"10 GAME POINTS,"
564 PRINT@239,"AND"
565 PRINT@297,"MONEY;" DOLLARS"
566 PRINT@451,"PRESS SPACEBAR TO
CONTINUE"
567 W$=INKEY$:IF W$<>CHR$(32) TH
EN GOTO 567
570 IF PL$=P1$ THEN T1=T1+10 ELS
E T2=T2+10
580 TUNE=0:P1=0:P2=0:F=0:X$="WRO
NG"
600 'TUNE TOPICS
601 CLS
602 PRINT@96,STRING$(32,45)
603 PRINT@352,STRING$(32,45)
604 PRINT@234,"TUNE TOPICS"
605 PRINT@292,"INSTRUCTIONS? <Y>
OR <N>"
606 I$=INKEY$
607 IF I$<>"Y" AND I$<>"N" THEN
GOTO 606
608 IF I$="Y" THEN GOSUB 10100
609 C$="YES"
610 'SELECT CATEGORY
620 T=RND(6)+20
625 FOR R=1 TO T
630 CLS
631 PRINT@96,STRING$(32,45)
632 PRINT@352,STRING$(32,45)
635 Y=RND(50)+200
640 SOUND Y,1
645 IF X=6 THEN X=0
650 X=X+1
655 PRINT@((111+X*32)-(LEN(CA$(X
))/2)),CA$(X)
660 FOR W=1 TO 50:NEXT W
665 NEXT R
670 PRINT@418,"WE'LL BE HEARING
SONGS FROM:"
675 PRINT@((463-(LEN(CA$(X))/2)),
CA$(X)
685 FOR W=1 TO 1000:NEXT W
690 'PLAY TUNE TOPICS
700 FOR A=1 TO 2

```

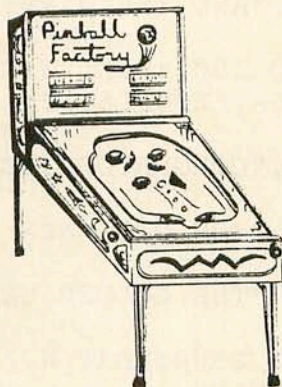
```

710 'SELECT RANDOM TUNE
720 TUNE=TUNE+1
730 GOSUB 4000
750 R=((X-1)*8+Y)*200
755 GOSUB 3000
760 GOSUB 5000
770 IF C=0 THEN GOSUB 6000 ELSE
CLS:PRINT@261,"TIMES UP...NEXT T
UNE":FOR W=1 TO 500:NEXT W:A=1
825 IF TUNE>=5 AND P1<>P2 THEN A
=2
830 NEXT A
840 IF P1>P2 THEN PL$=P1$ ELSE P
L$=P2$
850 CLS:PRINT@109,PL$
851 PRINT@168,"WINS TUNE TOPICS"
852 PRINT@238,"AND"
853 PRINT@297,"10 GAME POINTS"
854 PRINT@451,"PRESS SPACEBAR TO
CONTINUE"
855 W$=INKEY$:IF W$<>CHR$(32) TH
EN GOTO 855
860 IF PL$=P1$ THEN T1=T1+10 ELS
E T2=T2+10
870 TUNE=0:P1=0:P2=0:F=0:X$="WRO
NG":C$="NO"
900 OPEN"D",#2,"CLUES/DAT",100
903 'BID-A-NOTE
905 CLS
906 PRINT@96,STRING$(32,45)
908 PRINT@352,STRING$(32,45)
910 PRINT@235,"BID-A-NOTE"
911 PRINT@292,"INSTRUCTIONS? <Y>
OR <N>"
912 I$=INKEY$
913 IF I$<>"N" AND I$<>"Y" THEN
GOTO 912
914 IF I$="Y" THEN GOSUB 10200
915 DIM BI$(25)
920 FOR A=1 TO 2
925 CLS
930 'SELECT RANDOM TUNE
940 TUNE=TUNE+1
950 X=RND(6)
960 GOSUB 4000
970 R=((X-1)*8)+Y
980 GET#2,R
990 INPUT#2,CL$
1000 PRINT@33,"YOUR CLUE IS:"
1001 PRINT@64,CL$
1002 PRINT@128,STRING$(32,45)
1008 BI$(J)="15"
1010 FOR Z=1 TO 2
1020 J=J+1
1030 IF INT(J/2)=J/2 THEN PL$=P1
$ ELSE PL$=P2$

```



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## **Pinball Factory** by Kary McFadden

The video game comes full circle in this glorious tribute to the original. Classic pinball springs to life as never before, with fresh new angles that only the computer can offer. Crisp graphics, sound, and fast, smooth action give this machine-language arcade game a realistic, responsive feel you'll hardly believe. There are even "tilt" buttons that let you "bump" the machine!

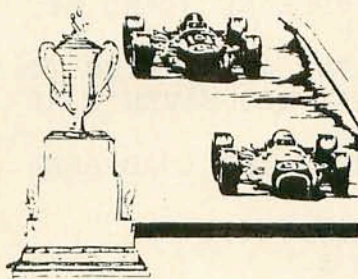
In addition to playing a great game of pinball, you can enjoy hours of creative pleasure as you design, build, and edit your own screens. Save and load your favorite creations. The joystick-controlled cursor makes it all easy.

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**Change the face:** draw your own title board with lines, rays, and shape patterns. Add text in three different colors, and two different sizes.

**Change the rules:** alter the gravity, bounce, and scoring!

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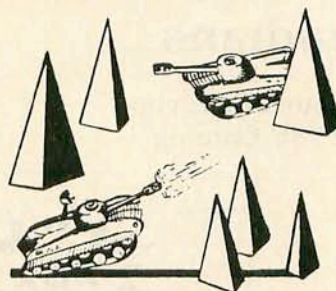
## **Speed Racer** by Steven Hirsch

The checkered flag drops as your pulse rises in this lively new arcade game. The road twists to the horizon on the 3-D panorama that sets the stage for the most exciting race the CoCo has ever seen!

Vie for time as you speed through the curves at incredible speeds. Step through the gears to stay ahead of the pack, but step lively since some will stop at nothing to see the end of the race, or the end of you!

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## **Rommel 3-D** by Kary McFadden

You clutch the tank controls, searching for any sign of the enemy. Suddenly a blip appears on radar! Frantically, you move your tank into position. At last you spot the elusive enemy tank! Facing it, you race to lock sights and fire before he does!

Enter the ultimate battle-zone in this exciting 3-D tank combat game. Strategy, speed, and your tank's cannon are your only hope as you wind through a three-dimensional course inhabited by impenetrable barriers and enemy tanks.

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```

1040 PRINT"YOUR BID PLEASE ";PL$
;
1050 INPUT BI$(J)
1060 IF LEFT$(BI$(J),1)="P" THEN
  Z=2 ELSE Z=1
1070 NEXT Z
1080 IF PL$=P1$ THEN PL$=P2$ ELSE
  PL$=P1$
1090 R=((X-1)*8+Y)*200
1100 PRINT STRING$(32,45)
1101 PRINT" YOUR CLUE WAS:"
1102 PRINT CL$
1110 PRINT "HERE ARE YOUR ";BI$(
  J-1);" NOTES ";PL$
1111 FOR W=1 TO 2000:NEXT W
1115 GOSUB 3000
1120 FOR K=1 TO VAL(BI$(J-1))
1130 GET#1,R
1140 INPUT#1,NO$
1150 PLAY NO$
1160 R=R+1
1165 IF INSTR(1,"#ABCDEFGH",RIGHT
  $(NO$,1))=0 THEN K=K-1
1170 NEXT K
1180 GOSUB 6000
1230 NEXT A
1240 IF P1>P2 THEN PL$=P1$ ELSE
  PL$=P2$

```

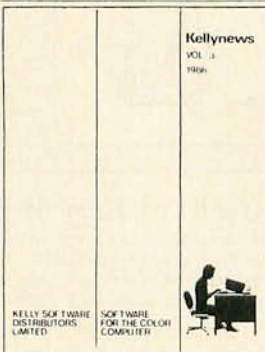
```

1260 IF PL$=P1$ THEN T1=T1+20 EL
  SE T2=T2+20
1270 IF T1>T2 THEN PL$=P1$ ELSE
  IF T2>T1 THEN PL$=P2$ ELSE GOSUB
  7000
1280 CLS
1281 PRINT@197,"AND THE WINNER I
  S....."
1282 FOR W=1 TO 1500:NEXT W:CLS
1283 PRINT@(206-(LEN(PL$)/2)),PL
  $;"!!!"
1284 PRINT@328,"CONGRATULATIONS!
  "
1285 PRINT@387,"YOU WILL NOW GO
  ON ALONE TO"
1290 PRINT@455,"THE GOLDEN MEDLE
  Y!"
1295 FOR W=1 TO 2500:NEXT W
1300 'GOLDEN MEDLEY
1301 CLS
1302 PRINT@96,STRING$(32,45)
1303 PRINT@352,STRING$(32,45)
1304 PRINT@233,"GOLDEN MEDLEY"
1305 PRINT@292,"INSTRUCTIONS? <Y
  > OR <N>"
1306 I$=INKEY$
1307 IF I$<>"Y" AND I$<>"N" THEN
  GOTO 1306
1308 IF I$="Y" THEN GOSUB 10300
1309 CLS
1310 PRINT@198,"PLEASE STAND BY.
  ...."
1311 PRINT@355,"WE ARE TRYING TO
  FIND 5 SONGS THAT YOU HAVEN'T AL
  READY HEARD."
1315 'PICK 5 TUNES AND LOAD ARRAYS
1320 DIM GM$(5),N2$(5,175)
1330 FOR K=1 TO 5
1335 C$="NO"
1340 GOSUB 4000
1345 GM$(K)=TUNE$
1350 R=((X-1)*8+Y)*200
1360 F=0
1370 FOR C=1 TO 2
1380 F=F+1
1390 GET#1,R
1400 INPUT#1,N2$(K,F)
1410 IF N2$(K,F)="P20" THEN C=2
  ELSE C=1
1420 R=R+1
1430 NEXT C
1435 RE$(K)="YES"
1440 NEXT K
1500 'PLAY GOLDEN MEDLEY
1505 NT=0
1510 FOR C=1 TO 2
1520 FOR K=1 TO 5
1530 IF RE$(K)="YES" THEN GOSUB

```

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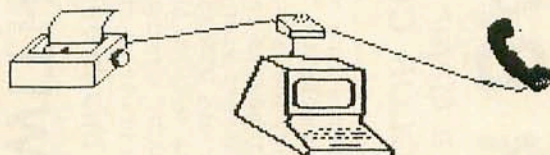
8000 ELSE GOTO 1560
1540 PRINT@38,"<A>NSWER OR <P>AS
S?"
1545 I$=INKEY$
1550 IF I$<>"A" AND I$<>"P" THEN
GOTO 1545
1555 IF I$="A" THEN RE$(K)="NO":
GOSUB 9000
1560 NEXT K
1565 A$=""
1570 FOR K=1 TO 5
1580 IF RE$(K)="YES" THEN A$="AG
AIN"
1590 NEXT K
1600 IF A$="AGAIN" THEN C=1 ELSE
C=2
1610 NEXT C
2000 'YOU WIN
2010 CLS
2015 PRINT@72,"CONGRATULATIONS"
2020 PRINT@ (111-(LEN(PL$)/2)),PL
$;"!"
2025 PRINT@194,"IF THIS WERE THE
REAL THING, YOU WOULD HAVE JU
ST WON THE OPPORTUNITY TO GO
ON TO PLAY FOR $100,000. UNFORT
UNATELY, THIS IS NOT THE REAL
THING."
2030 GOTO 10600
3000 'DRAW SOME NOTES
3010 W=RND(8)
3020 CLS(W)
3030 F$=CHR$(128)
3040 B$=CHR$(131+16*(W-1))
3050 E$=CHR$(138+16*(W-1))
3060 D$=CHR$(143+16*(W-1))
3070 PRINT@171,E$+B$;
3080 FOR W=1 TO 10:PRINT D$;:NEX
T W
3085 PRINT E$+B$;
3087 FOR W=1 TO 14:PRINT D$;:NEX
T W
3090 PRINT E$+B$+D$+D$+E$;
3095 FOR W=1 TO 7:PRINT D$;:NEXT
W
3100 PRINT E$+B$+D$+D$+E$;
3105 FOR W=1 TO 15:PRINT D$;:NEX
T W
3110 PRINT E$+D$+D$+F$+F$+D$+D$+D
$+E$+B$+D$+D$+E$+D$+D$+F$+F$;
3120 PRINT@262,F$+F$;
3125 FOR W=1 TO 7:PRINT D$;:NEXT
W
3130 PRINT E$+D$+D$+F$+F$;
3135 FOR W=1 TO 12:PRINT D$;:NEX
T W
3140 PRINT@302,F$+F$;
3145 FOR W=1 TO 16:PRINT D$;:NEX

```

```

T W
3150 FOR W=1024 TO 1056
3160 POKE W,42
3170 NEXT W
3180 FOR W=1 TO 14
3190 POKE(1055+W*32),42
3200 POKE(1056+W*32),42
3210 NEXT W
3220 FOR W=1503 TO 1535
3230 POKE W,42
3240 NEXT W
3250 RETURN
4000 'PICK TUNE SUBROUTINE
4010 FOR L=1 TO 2
4020 TRY$="OK"
4030 Y=RND(8)
4035 IF C$<>"YES" THEN X=RND(6)
4040 TUNE$=SO$(X,Y)
4050 FOR J=1 TO ST
4060 IF TUNE$=ST$(J) THEN TRY$="
NO"
4070 NEXT J
4080 IF TRY$="NO" THEN L=1 ELSE
L=2
4090 NEXT L
4100 ST=ST+1
4110 ST$(ST)=TUNE$
4120 RETURN

```



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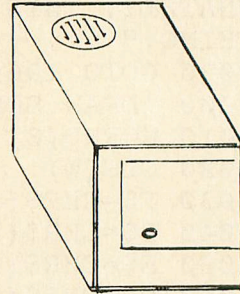
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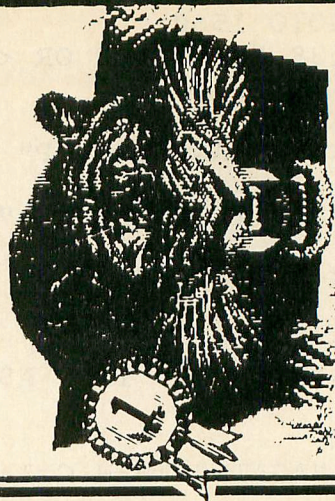
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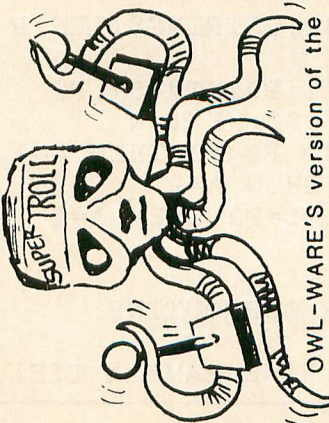
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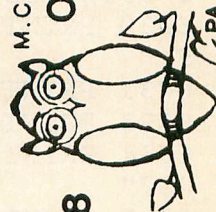
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```

4999 'PLAY TUNE SUBROUTINE
5000 F=0
5001 FOR C=1 TO 2
5010 F=F+1
5020 GET#1,R
5030 INPUT#1,NO$(F)
5040 IF NO$(F)="P20" THEN C=2 ELSE C=1
5050 R=R+1
5060 NEXT C
5065 TIMER=0:C=0
5070 FOR H= 1 TO F
5080 PLAY NO$(H)
5100 P=PEEK(65280)
5110 IF P=254 THEN PL$=P1$:H=F
5120 IF P=253 THEN PL$=P2$:H=F
5125 IF TIMER>=2000 THEN H=F:C=1
5130 NEXT H
5135 IF P<>254 AND P<>253 AND C<>1 THEN GOTO 5070
5140 RETURN
6000 'ANSWERING SUBROUTINE
6005 CLS
6010 PRINT@12,PL$;"!!"
6015 PRINT@65,"PRESS SPACEBAR TO CHECK ANSWER"
6020 IF INKEY$=CHR$(32) THEN GOTO 6030 ELSE GOTO 6020
6030 PRINT@129,"THE SONG TITLE IS:"
6031 PRINT@197,TUNE$
6033 PRINT@256,STRING$(32,45)
6034 PRINT@295,"<R>IGHT OR <W>ONG?"
6035 ANSWER$=INKEY$
6036 IF ANSWER$<>CHR$(82) AND ANSWER$<>CHR$(87) THEN GOTO 6035
6038 IF ANSWER$="R" THEN X$="RIGHT"
6040 IF PL$=P1$ AND X$="RIGHT" THEN P1=P1+1 ELSE IF PL$=P2$ AND X$="RIGHT" THEN P2=P2+1
6045 S1=(359-(LEN(P1$)/2))
6050 S2=(375-(LEN(P2$)/2))
6055 PRINT@ S1,P1$:PRINT@ S2,P2$
6060 PRINT@ (S1+32),STRING$(LEN(P1$),45)
6065 PRINT@ (S2+32),STRING$(LEN(P2$),45)
6070 PRINT@421,P1:PRINT@437,P2
6075 FOR W=1 TO 500:NEXT W
6080 IF P1<>3 AND P2<>3 THEN A=1
6090 IF TUNE>=5 THEN A=2
6095 IF A=2 AND P1=P2 THEN A=1
6100 X$="WRONG"
6110 RETURN
7000 'TIEBREAKER SUBROUTINE
7001 CLS
7002 PRINT@38,"!!!WE HAVE A TIE!

```

```

!!"
7003 PRINT@101,"YOU BOTH HAVE 20 POINTS, SOWE WILL PLAY A TIEBREAKING SONG TO SEE WHO GOES ON TO THE GOLDENMEDLEY. PRESS YOUR FIRE BUTTON WHEN YOU KNOW THE SONG. A WRONG ANSWER WILL LEAD TO ANOTHER SONG. ";
7004 PRINT"THE FIRST CORRECT ANSWER WILL END THE TIEBREAKER."
7005 PRINT@419,"PRESS SPACEBAR TO CONTINUE"
7006 I$=INKEY$: IF I$<>CHR$(32) THEN GOTO 7006
7007 GOSUB 3000
7008 FOR Z=1 TO 2
7010 C$="YES"
7020 GOSUB 4000
7030 R=((X-1)*8+Y)*200
7040 GOSUB 5000
7050 CLS
7053 PRINT@45,PL$;"!!"
7055 PRINT@97,"PRESS SPACEBAR TO CHECK ANSWER"
7056 W$=INKEY$:IF W$<>CHR$(32) THEN GOTO 7056
7057 PRINT@161,"THE SONG TITLE IS:"
7058 PRINT@196,TUNE$
7059 PRINT@295,"<R>IGHT OR <W>ONG"
7060 ANSWER$=INKEY$
7061 IF ANSWER$<>CHR$(82) AND ANSWER$<>CHR$(87) THEN GOTO 7059
7062 IF ANSWER$="R" THEN X$="RIGHT"
7090 IF X$="RIGHT" THEN Z=2 ELSE Z=1
7100 NEXT Z
7110 RETURN
8000 'PLAY TUNE(GOLDEN MEDLEY)
8005 GOSUB 3000
8010 F=0:TIMER=NT
8011 T=VAL(RIGHT$(N2$(K,1),1))
8012 N2$(K,1)=LEFT$(N2$(K,1),1)+STR$(T+1)
8020 FOR R=1 TO 2
8025 PRINT@27,INT(TIMER/66)
8030 F=F+1
8040 PLAY N2$(K,F)
8050 IF N2$(K,F)="P20" THEN F=0
8060 P=PEEK(65280)
8070 IF P<>126 AND P<>254 THEN R=1 ELSE R=2:NT=TIMER
8080 IF TIMER>=2000 THEN GOTO 1050
8090 NEXT R
8100 CLS
8110 RETURN

```



```

9000 'ANSWER SUBROUTINE(GOLDEN M
EDLEY)
9010 PRINT@65,"PRESS SPACEBAR TO
CHECK ANSWER"
9020 IF INKEY$<>CHR$(32) THEN GO
TO 9020
9030 PRINT@129,"THE SONG TITLE I
S:"
9032 PRINT@197,GM$(K)
9034 PRINT@256,STRING$(32,45)
9036 PRINT@295,"<R>IGHT OR <W>RO
NG?"
9050 ANSWER$=INKEY$
9060 IF ANSWER$<>CHR$(82) AND AN
SWER$<>CHR$(87) THEN GOTO 9050
9070 IF ANSWER$=CHR$(87) THEN GO
TO 10500
9080 RETURN
10000 CLS
10005 PRINT@41,"MELODY ROULETTE"
10010 PRINT@73,STRING$(15,45)
10015 PRINT
10020 PRINT"THE WHEEL WILL SPIN
TO SEE HOW MUCH MONEY YOU'RE PL
AYING FOR. THEN YOU'LL LISTEN T
O A MAXIMUM OF 5 SONGS."
10025 PRINT" IF YOU KNOW A SONG
, PRESS YOURJOYSTICK BUTTON. THE
PLAYER WITHTHE MOST POINTS OUT
OF 5 SONGS WINS THIS PART. MEL
ODY ROULETTE IS WORTH 10 GAME PO
INTS."
10030 PRINT@451,"PRESS SPACEBAR
TO CONTINUE"
10035 I$=INKEY$
10040 IF I$<>CHR$(32) THEN GOTO
10035
10045 RETURN
10100 CLS
10105 PRINT@43,"TUNE TOPICS"
10110 PRINT@75,STRING$(11,45)
10115 PRINT
10120 PRINT"A RANDOM CATEGORY WI
LL BE CHOSEN AFTER WHICH A MAXIMU
M OF 5 SONGSWILL BE PLAYED FROM
THE CHOSEN CATEGORY. ONCE AGAIN
, PRESS YOURJOYSTICK BUTTON IF Y
OU KNOW THE SONG. TUNE TOPICS IS
WORTH 10 GAME POINTS."
10125 PRINT@451,"PRESS SPACEBAR
TO CONTINUE"
10130 I$=INKEY$
10135 IF I$<>CHR$(32) THEN GOTO
10130
10140 RETURN
10200 CLS
10205 PRINT@43,"BID-A-NOTE"
10210 PRINT@75,STRING$(10,45)
10215 PRINT

```

```

10220 PRINT"A CLUE WILL BE GIVEN
, FOLLOWED BY BIDDING. THE FIRS
T BIDDER CAN NOT PASS, ALTHOUGH
BIDDING CAN START AS HIGH AS 15.
ONCE AGAIN, A MAXIMUM OF 5 SONG
S WILL BE PLAYED. BID-A-NOTE
IS WORTH 20 GAME POINTS.";
10225 PRINT" THIS IS THE LAST
PART BEFORE THE WINNER GOES ON,
ALONE, TO PLAY THE GOLDEN MEDLEY
"
10230 PRINT@451,"PRESS SPACEBAR
TO CONTINUE"
10235 I$=INKEY$
10240 IF I$<>CHR$(32) THEN GOTO
10235
10245 RETURN
10300 CLS
10305 PRINT@41,"GOLDEN MEDLEY"
10310 PRINT@73,STRING$(13,45)
10315 PRINT
10320 PRINT"YOU'RE ON YOUR OWN N
OW AND YOU HAVE 30 SECONDS TO N
AME 5 TUNES. PRESS THE LEFT JOYS
TICK BUTTON TO STOP THE SONG. YO
U CAN EITHERNAME THE SONG OR PAS
S ON IT TILLYOU'VE NAMED THE RES
T.";
10325 PRINT" THE TIMER ONLY RUNS
WHEN THE MUSIC IS PLAYING. T
HE GAME IS OVER AS SOON AS YO
U ANSWER INCORRECTLY."
10330 PRINT@451,"PRESS SPACEBAR
TO CONTINUE"
10335 I$=INKEY$
10340 IF I$<>CHR$(32) THEN GOTO
10335
10345 RETURN
10500 CLS
10510 PRINT@77,"SORRY"
10520 PRINT@ (111-(LEN(PL$)/2)),P
L$;"!"
10530 PRINT@194,"IT WAS A GOOD G
AME AND YOU PLAYED WELL,BUT Y
OU DIDN'T QUITE MAKE IT TO THE E
ND. NOT TO FRET...THERE WAS
NO PRIZE FOR WINNING THIS G
AME ANYWAY!"
10600 FOR W=1 TO 5
10610 F=0
10620 FOR J=1 TO 2
10630 F=F+1
10640 PLAY N2$(W,F)
10650 IF N2$(W,F)="P20" THEN J=2
ELSE J=1
10660 NEXT J
10670 NEXT W
10675 CLS
10680 END

```



# Teaching Language Idioms

By Steve Blyn  
Rainbow Contributing Editor

**T**his month's program is a playful one designed mainly for those in the middle grades. It's good for all of us to occasionally take a break from more serious educational programs. This program points out idioms, one of the peculiarities of our language. We are going to have fun with some idioms that refer to bodily figures of speech. We have included such expressions as "crossed fingers," "toe the mark" and "nose to the grindstone."

If your students are motivated to discover the derivation of these idioms, then we have accomplished even more than we set out to do. We'll demonstrate how to add to the list to make it more comprehensive. Our main purpose, though, is enjoyment. We intend to show students that the computer can easily produce fun and educational programs.

While testing the program with middle school students, we found that a great source of amusement was the

errors made — some deliberately. Even after the students learned the idioms, they had a lot of fun entering answers other than the correct ones. "With tongue in cheek" became "with toe in cheek." "Feet of clay" became "nose of clay" and so forth. This experiment inspired a jovial atmosphere — laughing girls and boys, chuckling teachers, animated discussion, thinking out loud — it was delightful.

Lines 40 and 50 set the dimensions at 15 questions and answers. 'N' was set at 15 simply because we ran out of body-part idioms. If you can think of others, add more DATA lines and adjust the number on Line 40 accordingly. Lines 60-80 read these questions and answers from the DATA lines.

Line 100 chooses a random question and answer (variable 'R'). The program gives six answers from which to choose. The variable 'J' in Line 110 subtracts a number between one and five from the correct answer. The six answers printed start at the true number (R) less 'J' and include five more choices. The true answer is ensured a place among the six listed. Lines 170-190 print out the choices.

The only problem is the 'J' variable may fall below number one, or the 'J'-plus-five amount may exceed the 15

listed answers. If these situations occur, we encounter several BS errors. This indicates there is no such string. To prevent these problems, we set further restrictions on the 'J' values in lines 120 and 130.

Line 200 asks the question and Line 210 waits for the answer. Lines 220 and 230 evaluate whether the answer is correct. Line 240 prints the correct answer if the student gives an incorrect response. Lines 250-270 wait for the user to press the ENTER key to continue. If 'E' is pressed, the program ends.

We assumed that players would soon master this program completely since there are only 15 questions. Therefore, we did not include a scorecard. If it is needed, you could display the score at the bottom of the screen at all times. We included an extra variable (CR) on Line 220 to count the correct answers.

We hope your child or student enjoys learning these idioms. Perhaps you or they will be creative and produce a similar program with other idioms. Colors would be a good possibility, using questions such as "-- as a beet" or "-- with envy" or "feeling sad and --." We here at Computer Island always enjoy hearing from readers about their experiences with the programs in this column. □

*Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.*

## The listing: IDIOMS

```
10 REM"UNUSUAL USE OF OUR LANGUAGE"
```

```
20 REM"STEVE BLYN, COMPUTER ISLAND, NY, 1986
30 Z$=STRING$(32,255)
40 N=15
```



```

50 DIM A$(N),B$(N)
60 FOR T= 1 TO N
70 READ A$(T),B$(T)
80 NEXT T
90 CLS:PRINT"          OUR STRANGE LA
NGUAGE"
100 R=RND(N)
110 J=R-RND(5)
120 IF J<1 THEN J=1
130 IF J>10 THEN J=10
140 PRINT@32,Z$
150 PRINT@288,Z$;
160 PRINT@320,"";
170 FOR T=J TO J+5
180 PRINTB$(T),
190 NEXT T
200 PRINT@64,A$(R):PRINT:PRINT"N
AME THE BODY PART - ";
210 LINEINPUT G$
220 IF G$=B$(R) THEN PLAY"O3L100
CCDECEFFGGGG":CR=CR+1:GOTO 250
230 IF G$<>B$(R) THEN PLAY"O1L10
0FFF"
240 PRINT:PRINT"          THE ANSWER I
S "B$(R)
250 PRINT:PRINT"          PRESS ENTER
TO GO ON";
260 EN$=INKEY$

```

```

270 IF EN$=CHR$(13) THEN 90 ELSE
IF EN$="E" THEN END
280 GOTO 260
290 DATA ----- OF CONTENTION.,B
ONE
300 DATA SPLITTING -----.,HAIRS
310 DATA ----- TO THE WHEEL.,SH
OULDER
320 DATA WITH ----- IN CHEEK.,T
ONGUE
330 DATA TURN THE OTHER -----.,
CHEEK
340 DATA WITH ----- CROSSED.,FI
NGERS
350 DATA ----- THE MARK.,TOE
360 DATA ARMED TO THE -----.,TE
ETH
370 DATA ----- GREASE.,ELBOW
380 DATA ----- IN GLOVE.,HAND
390 DATA STAB IN THE -----.,BAC
K
400 DATA ----- TO THE GRINDSTON
E.,NOSE
410 DATA DON'T STICK YOUR -----
OUT.,NECK
420 DATA IN ONE ----- AND OUT TH
E OTHER.,EAR
430 DATA ----- OF CLAY.,FEET

```

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# Robots: Their Place in Education

**By Michael Plog, Ph.D.**  
**Rainbow Contributing Editor**

---

A young woman was spending a rainy summer vacation with a group of artistic people, including some major literary "names." The group, restricted to indoor activities, told eerie stories for amusement. One of the venerable members of the group suggested that everyone write a ghost story. The young woman, named Mary Godwin, wrote a horror story based on a dream she had a few nights after the suggestion. She later married one of the members of that group, Percy Bysshe Shelley. Whether or not you have heard of Percy or Mary, you certainly know Mary's horror story, *Frankenstein* (or, the *Modern Prometheus*).

Mary Shelley's book became a prototype for horror stories, particularly those concerning robots. Mary had never heard the term "robot." Her book was written in 1818 and the word robot

came into being in a 1920 play by Karel Capek titled *R.U.R.* The word robot comes from the Czech word "robotnik," for worker or serf. Capek wrote about people creating mechanical beings to do work for humans.

Science fiction writer Isaac Asimov has been called "the father of robotics" because of the many stories he has written about the mechanical creatures. And for another important reason — Asimov's robots are not creatures who turn on their creators (like Frankenstein), but are manufactured by engineers to fit exacting specifications. The most important of these specifications is that robots may not harm human beings. Their circuits simply do not allow such an action. Thus, modern robot stories eliminate the fear (the Frankenstein complex) people have about mechanical intelligence.

Modern robots are industrial automations that perform a series of steps to complete a task. Robots are not yet made in the general shape of humans and have extremely limited intelligence. My daily life seldom brings me in touch with industrial robots, but I have a few contacts with other types. For example, I interact with a robot when making

long distance telephone calls. I simply dial an 800 number, enter my access number, then dial the number I want to reach. This all takes place with the aid of robots.

Besides industrial robots, there are robot "toys" for the home. Some of these machines are built in a similar fashion to the *Star Wars* robots and can perform a variety of tasks. The home robots, as well as industrial robots, need to be programmed. Indeed, a robot has a computer "brain" to allow human programming.

Since robots use computers, and may be considered as a subcomponent of the field of computer science, it is only natural that robots function in schools as well as factories and homes. Generally, they are used in computer classes and electronics courses. Students learn about robots by building the mechanical workers and programming them to perform a task.

When computers first appeared in schools, educational leaders wondered and debated about their use. In the beginning, they were used in classrooms to teach *about* computers. More recently, myriad uses have been made of computers in schools. Students use

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*Michael Plog received his doctorate degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district and currently is employed at the Illinois State Board of Education.*

---



them for a multitude of purposes other than learning BASIC programming. In fact, students can be declared computer literate without ever knowing about binary addition and subtraction. Computers are being used more and more as learning tools in classrooms. Students use word processing packages to write reports, database programs are used to examine information from science experiments, and the list goes on.

The educational community has spent over a decade debating the computer's role in elementary and secondary education. The debate continues even today, although most educational professionals consider the computer to be an additional (and very important) tool for students in the classroom, with a wide variety of purposes. There is no reason to expect the debate over the educational role of robots to be any less active than the debate over computer uses. What are appropriate activities for robots in the school? Should students simply learn about them, then consider the utility of robotics finished? Should robots be used as another tool for students, in the same way computers are an educational tool?

Despite similarities, robots and computers are not the same thing. Computers tend to be more oriented toward mental activities. Robots, on the other hand, tend to interact with the physical environment in a much more direct way than computers. For example, consider students working with a word processing package. The actual printing of a page is a physical activity, but is much less important than the mental activity of the student creating the document.

When you sit down in front of the Color Computer to write a program, most of the activity is the relationship between your mind and the screen. Not so with a robot. The observable activity of a robot performing a task deals with physical objects. Screws are tightened, materials are moved from one place to another, objects are assembled, and so on. The programming of a robot may involve the same mental activity as the programming of the Color Computer, but the end result differs.

Another feature of modern robots is their level of intelligence is not (and may never be) that which exists in fiction. A robot teacher may exist in science fiction stories, but will not be a reality

in a classroom during my lifetime. A robot message carrier, however, is a tangible reality.

With current technology, we can reasonably expect robots to perform any task a well-trained pet can perform. Before the end of this century, we may see a robot collecting lunch counts from teachers and delivering this information to the school cafeteria. It is not unreasonable to expect a robot to sweep the gym floor between classes, or to inform the administration when a child wanders away from the playground. But, I seriously doubt a robot will decide the grade a student should receive in math class, or referee an intramural basketball game.

The future of educational robots will probably be more interesting than the present fiction. The current reality of computers in education is much more than past science fiction writers ever dreamed. I would enjoy hearing about the uses of robots in your school. If there is such a creature (even if it deserves the nickname "Frankenstein") in your school, please let me know of your experiences. My address is 829 Evergreen, Chatham, IL 62629. ☺

### Two-Liner Contest Winner . . .

Here's a great little ski game. Use your right joystick to maneuver the player through as many of the 20 gates as possible. This would also be a good candidate for the speed-up POKE once you become experienced.

#### The listing:

```
1 CLS:PRINT"ski-run":FORI=1TO999
:NEXT:P=6:PRINT"READY":FORI=1TO9
99:NEXT:CLS:FORI=1TO21:G9=G:G=RN
D(10)+2:FORJ=1TO16:FORZ=1TO50:NE
XT:PRINT" *TAB(14) *":POKE1024+
P,72:IFJOYSTK(0)<9THENP=P-1:IFP=
2THENP=3ELSEELSEIFJOYSTK(0)>54TH
ENP=P+1:IFP=13THENP=12
2 NEXT:IFI=21THENIFG9=P THENSC=S
C+5:SOUND99,1:PRINT" STRING$(14
,"-")TAB(20)"finish","SCORE->"SC
:ELSEPRINT" STRING$(14,"-")TAB(
20)"finish","SCORE->"SC ELSEPRIN
T" *TAB(G-1)!!"TAB(14) *"TAB(
20)"GATE":IFG9=P THENSC=SC+5:SO
UND99,1:NEXTELSENEXT
```

Jason Steele  
Pensacola, Florida

(For this winning two-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape*.)

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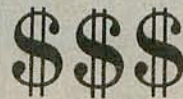
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*An easy way to determine EPROM erasure times*

# Now You See It, Now You Don't!

By Marty Goodman

**A**ccording to reports by the makers of CoCo EPROM programmers, over 2,000 Color Computer owners have EPROM programmers. These programmers are an essential tool for those wanting to customize their ROM software or wanting to make alternate character sets of their lower kits or 80-column cards.

All owners of EPROM programming devices will want to have an EPROM eraser. The eraser is simply a box with an ultraviolet light that has a particular peak wavelength output (2,537 Angstrom units). When this light is shined on an EPROM, it erases what has been programmed into it. But, how long does this process take? There is often much confusion about this and I have a simple answer.

Get several of the EPROMs you

usually work with. Program them with all zeros. This sets every bit inside the EPROM (an erased EPROM is set at all ones). Be sure to clean the quartz windows on used EPROMs with lighter fluid because particles of grease and adhesive can impede erasure.

Put the programmed EPROMs into the eraser and expose them to the UV light for one minute. Take them out and check to see if they are erased. If they are, the eraser is too strong. Try to increase the distance between the EPROM and the light bulb and try again.

Continue the process of putting the EPROMs into the eraser and checking every 30 seconds. This way, you can determine the apparent time of erasure. This time should be between one and one-half and seven minutes. To determine the proper erasure time, multiply this apparent time by five. For example, if the chip is not erased at the one and one-half minute check, but is at two minutes, the time for that brand and type of chip in that particular erasure is 10 minutes.

There may be significant variations between different brands and types of chips. My tests indicate most 27 series EPROMs behave about the same, but the Motorola 6876X series appear to take somewhat more time to erase.

Note that this technique requires nothing other than a clock, an EPROM burner and the EPROM eraser. It is far simpler, and more accurate, than any attempt to calculate the theoretical time needed for erasure using the manufacturer's specification for "nominal erasing energy" reported in watt-sec/cm-cm and the rated energy output of your UV bulb.

My source for this information is an old article on erasing 1702-type EPROMs. Note it is not proper to merely expose an EPROM to UV for the minimum time needed for it to appear erased when read in the EPROM programmer. The cells in the EPROM that hold the information will not be fully discharged and may later cause it to behave erratically.

---

*Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator on CompuServe and Delphi.*



# RAINBOW Info

## How To Read Rainbow

Please note that all the BASIC program listings in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on the table of contents and at the beginning of articles indicates that the program is available through our RAINBOW ON TAPE service. An order form for this service is on the insert card bound in the magazine.

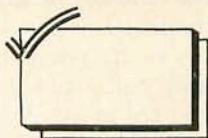
## What's A CoCo?

CoCo is an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

However, when we use the term CoCo, we refer to both the Tandy Color Computer and the TDP System-100 Computer. It is easier than using both of the "given" names throughout THE RAINBOW.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and Tandy Color are, for all purposes, the same computer in a different case, these terms are almost always interchangeable.

## The Rainbow Check Plus



The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

*Rainbow Check PLUS* counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and *SAVE* it for later use, then type in the command *RUN* and press *ENTER*. Once the program has run, type *NEW* and press *ENTER* to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down-arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK(35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IF W=7985 THEN B0 ELSE PRINT
  "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

## Using Machine Language

Machine language programs are one of the features of THE RAINBOW. There are a number of ways to "get" these programs into memory so you can operate them.

The easiest way is by using an editor/assembler, a program you can purchase from a number of sources.

An editor/assembler allows you to enter mnemonics into the CoCo and then have the editor/assembler assemble them into specific instructions that are understood by the 6809 chip, which controls your computer.

When using an editor/assembler, all you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an *ORIGIN* statement or an *EQUATE*. In short, you have to know something about assembly to hand-assemble some programs.

Use the following program if you wish to hand-assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE:";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00 and change the value of I to &H7F80.

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We will appreciate knowing of instances of violation of Seal use.



Add an extra 22K of memory to Disk BASIC 1.1

# Discover the 'Hidden' Five Tracks

By Jim Peake

**If** you own the new white Radio Shack disk drive (catalog number 26-3029) with Disk BASIC 1.1, you may have a 40-track drive masquerading as a 35-track drive. The new drives without the little tab to eject the disk are different from the old gray drives.

After more than three years of cassette loading, I broke open the piggy bank and bought a new drive in December 1983. Sure enough, it looks different. Rumor has it that it's a Model 4 drive from TPI. After six months of loyal service on my 1980-vintage D-board CoCo, I attached it to my new 64K CoCo 2. After experimenting to see how many tracks it really has, I discovered it works fine as a 40-tracker.

I've written a small program of POKEs to modify the disk ROM for 40 tracks. To use it, you must have a 64K CoCo. You must also have a program to load the BASIC ROMs into the upper 32K of RAM, and switch the CoCo to the all-RAM mode. And you must have the

new Disk BASIC 1.1 ROM. This change does not work with the 1.0 ROM because all the POKE addresses are different and you would need 40-track drives rather than the 35- or 36-track gray drives.

So how do we make Disk BASIC 1.1 use 40 tracks? There are several things that must be done. First, move the ROMs to RAM and switch to the all-RAM mode so we can make changes with the POKE command. Second, BASIC must be modified to initialize 40 tracks with the DSKINI command. Third, the file allocation table, which keeps track of what granules have been used, must be enlarged to keep track of 78 granules instead of 68. Changes have to be made so it is all saved to disk and not cut off at 68. Next, FREE has to be modified to look for 78 granules.

I did not make the directory allow for more than 68 files because, as a practical matter, I cannot believe anyone would want that many files on one disk.

The file allocation table is easy enough to expand, but doing so limits the system to a maximum of three drives. This is because the system initialization routine reserves space for up to four file allocation tables. Since each table is 10 bytes bigger to hold 78 instead of 68 granule pointers, there is

not enough room for more than three file allocation tables. Again, it's much too complicated to move all subsequent work addresses and not worth the trouble.

The advantages of this modification for using 40 tracks are many. You can save money by using fewer disks. This modification is fully compatible with the diskettes already formatted in the official 35-track format. They operate normally while in the 40-track mode and are protected from unsuccessful attempts to use the last five tracks. The file allocation table indicates to the modified 40-track system that those tracks are not available. BACKUP is the only command that invites disaster if you try to use 35-track diskettes while in the 40-track mode.

There are some disadvantages to this 40-track modification. If you run the system without loading the modification, the unmodified system wreaks havoc with 40-track diskettes. It shortens the file allocation table to 68 granules, thus losing forever the last five tracks. Any files or programs that used any or all of that area are unusable, and the diskette will be a 35-track disk until reinitialized to 40 tracks, which wipes out everything on the diskette. It is also a nuisance to have to load the necessary

*Jim Peake lives in Northfield, Vermont, and is a systems analyst for the state. He has over 12 years of applications software experience. He purchased his first CoCo in 1980 and his family has rarely seen him since.*



programs for converting to 40 tracks each time you turn on the computer.

Of course, if you have an older drive that does not support 40 tracks, attempts to use the last five tracks result in an I/O error. And if Radio Shack or its supplier adjusts the drives to prevent using the last five tracks, then this modification won't work. I think the system is set up for upgrading to 40-track drives and Radio Shack probably will. If they do, they will have to put in

a few more checks than I did to ensure full compatibility with diskettes previously formatted for 35 tracks.

One last caution: This modification has not been rigorously tested in a variety of environments. Therefore, experiment carefully and test it to be sure it works dependably on your system before entrusting valuable data or hard work to it.

One does not start disassembling the ROMs without a good, comprehensive

map of what's what. In my case, the map and guiding light was the complete CoCo memory map published in the July, August, September and December 1983 issues of THE RAINBOW.

In conclusion, the new 1.1 system can easily be modified to use 40 tracks for storing up to 178,000 bytes of data on each diskette.

(Mr. Peake can answer questions about this program at 802-485-8922, 7 p.m. to 9 p.m. EST only.) □

#### The listing: TRACK40

```
1000 REM ROUTINE TO SET DISK
    BASIC 1.1 TO 40 TRACKS IN
    A 64K COCO
1001 ' WRITTEN JUNE 1984
    BY JIM PEAKE
1002 ' NOTE:: LIMITS TO A MAX OF
    3 DRIVES
1005 POKE&HD762,&H02 ' SETS
    DSKCON TO RETRY 2 TIMES
    INSTEAD OF 5. OPTIONAL MAY
    BE OMITTED.
1010 POKE&HD65F,&H28:POKE&HD682,
    &H28 ' SETS DSK*NI TO 40 TRACKS
1015 POKE&HD534,&H27 ' SETS DSKI
1020 POKE&HD29D,&H28 ' SETS DSKO
1030 POKE&HC735,&H4E ' SETS MOVE
    OF FILE ALLOCATION TABLE TO
```

```
10 MORE GRANULES
1035 POKE&HC75A,&H54 ' INCREASES
    SPACE FOR EACH DRIVE'S FAT
    TO ALLOW 10 MORE GRANULES
1040 POKE&HC7BB,&H4E ' SETS MOVE
    OF FAT TO 10 MORE GRANULES
1045 POKE&HC7D0,&H4E ' USE 78
    GRANULES NOT 68
1050 POKE&HC7EF,&H4E ' USE 78
1055 POKE&HCD26,&H4E ' SEARCH 78
    GRANULES
1060 POKE&HCEB5,&H4E ' LET FREE
    COMMAND CHECK 78 GRANULES
1065 POKE&HD44D,&H4E ' SET COPY
    TO 78 GRANULES
1080 POKE&HD7C0,&H0:POKE&HD816,&H1
    4 ' SET TO 6MS STEPPING RATE
```

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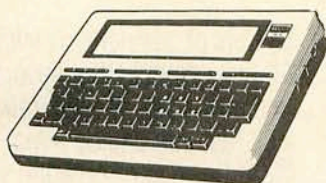
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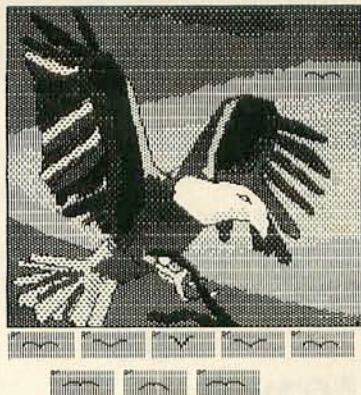
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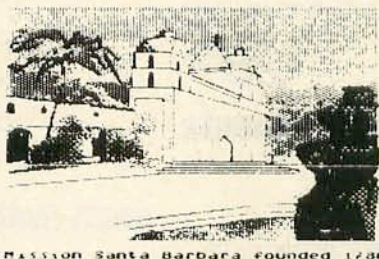
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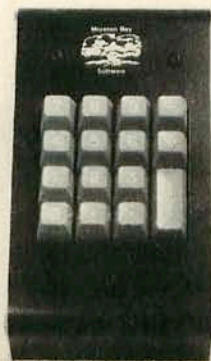
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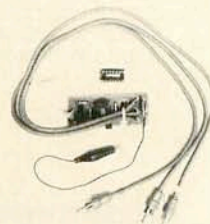
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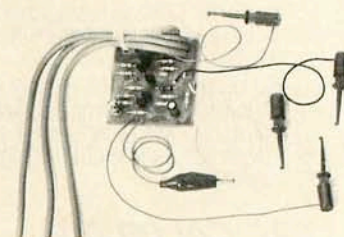
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# Database Ditties . . .

By Cray Augsburg  
Rainbow's CoCo SIGop

**T**here have been a lot of goings-on in our Color SIG, including a large amount of activity in the databases. Because of this, most of this month's column is devoted to Marty Goodman's database report.

Color SIG is rapidly increasing in size. We have 2,989 members and expect to have well over 3,000 members within a few weeks.

We have unofficial reports of our Forum activity versus the message activity on CompuServe. We average 380 posted messages a week to CompuServe's 430. This ratio, too, is rapidly changing in our favor.

There is a decrease in the number of users having problems adjusting to Delphi. Most people are finding it easier to use than "that other system."

## Contest Results

We recently had a contest to see who could write message number 6809. The "magic message" was written by Lloyd Pulley (FATONE). After winning, all Lloyd could say was, "I just logged on to see who won and now I find out it's me!" For his effort, he will receive a free 72-hour period on the Color SIG. Keep an eye open because we will be having similar contests in the future.

## Missing Words

Here is a correction for the May

*Cray Augsburg serves as RAINBOW's technical assistant and holds an associate's degree in electrical engineering. He and his wife, Ruth Ann, have two children and live in Louisville, Kentucky. His username on Delphi is RAINBOWMAG.*

"Delphi Bureau." At the top of Page 94, I describe how to locate specific RAINBOW ON TAPE files. Missing are the rules that explain this. They are:

- 1) To find a specific file, type  
READ MM/YY XXX Title  
where MM/YY is the date and XXX is the page number. The title may be omitted.
- 2) If the month (MM) has only one digit, such as February, then do *not* include a leading zero.
- 3) If the page number (XXX) has only two digits, then *do* use a leading space.

The examples should now make sense.

## Strike up the Band Already!

Everything appears to be running smoothly on the Color SIG. We have lived up to our word and now submissions to the database are being enabled usually within 24 hours.

The only area that causes some concern is the Music topic of the database. As a music lover, I find the lack of activity there disconcerting (pun fully intended). I urge all members to search through their files at home. Surely you can find at least one or two music files you would like to submit.

Keep in mind that there are several people with considerable experience who "reside" on our Color SIG. If you have any questions, you can always leave them in Forum. They are sure to be answered quickly. Now let's see what good news Marty has to bring us . . .

## Database Manager's Report

In the four weeks that have gone by since I assumed the job of database manager on Delphi, quite a lot has happened in our CoCo SIG database.

I have posted some new text files that may be of interest, including one on *legal* telephone "phreaking," describing how I cut my Delphi telephone bill from \$150 to \$13 per month. A new *NEWBOX* file is more speculation about the coming Color Computer. There's also an essay on the issue of *pornography*, and how it relates to our SIG.

### Graphics

We have four new art galleries containing 12 to 20 pictures each by famous CoCo artists Ana Landa, Ron Kiyomura, Linda Neilson and Erik White. These are among

the best CoCo art ever produced. Many are winners of RAINBOW's "CoCo Gallery" awards.

There are a number of new individual files, including *Red Riding Hood*, an enhanced video digitized image. Also in the Graphics section is a digitized and animated image of guess who, under the heading GUESS WHO.

Stephen Macri (**DRACMAN**) has given us a nice updated anatomical chart of the brain, with special attention to CoCo-related functions. Mark Kowit (**TOBOR8**) has contributed a set of three enhanced digitized images, including a clever one called *Eat Strawberries*. Erik Gavriluk (**ERIKGAV**) has uploaded a gallery of 15 digitized images, including a particularly interesting one, *Baby*.



*Graphicom* is well-supported in the database, with alternative menus and font set screens. If more *Graphicom* users will drop me a line on the Forum or in MAIL, I can upload a lot more alternate *Graphicom* fonts and stamp sets. All you need do is ask. I have about a 50 or more such files.

We also have a fresh upload of *McPaint*, a "guiltware" product (you are asked to send the author a few bucks if you like and use the program). This is a graphics editor for the CoCo vaguely similar to *Graphicom* and *CoCo Max*. Along with the new *McPaint* upload, we have a set of about 15 fonts for *McPaint*. And from the same authors (Eric Gavriluk and Greg Miller) we have a set of *Animate* utilities that allow you to make (and hopefully later upload to us for all to see) short animation sequences from the pictures you draw. Best of all, Erik and Greg, the talented creators of *McPaint* and *Animate*, are available on our forum for questions.

Art Flexser has contributed his *MAXCMP* utility to our graphics section. This utility allows you to convert CoCo graphics screens from *Graphicom*, *CoCo Max* and other graphics editors into our .PIX format, an ASCII BASIC version of the picture that can be downloaded. I recommend that anyone who wants to upload CoCo art to Delphi or other BBS systems get and use this file.

Loren J. Howell (XENOS) has given us a CGP-115 (color printer plotter from Tandy) screen dump for full-color dumps of *CoCo Max* files.

### Hardware Hacking

I have uploaded in this section all of my software development tools for creating character generator ROMs for the PBJ *Word-Pak I*, and for all makes of CoCo lowercase kits. There are also some data files with my favorite fonts sets for such things. All you need to do is download those data files and burn them into an EPROM, and you can customize your screen character font if you own a lower kit or PBJ *Word-Pak*. There is also an article by Don Hutchison on how to interface a Microfazer buffer to the CoCo, and a chart I made of the pinouts of most common EPROMs.

Also in the Hardware Hacking database is an alternate driver software for the Intronics Ver. 2 EPROM programmer. With this patched software (which I wrote), you will have the option of proper slow programming of EPROMs, a needed option due to reports of unreliability in the long-term data storage of EPROMs programmed with that programmer in its normal (fast) mode.

### Data Communications

Art Flexser has uploaded a series of fixes for *Colorcom/E* Version 3. These patches

allow you to correct some serious flaws in the currently released version.

Don Hutchison (DONHUTCHISON) has given us a superb discussion of the workings of 1200 Baud modems and addresses the question of whether or not it pays to get one.

Steve Bjork (6809ER) has uploaded the latest revision of his conferencing program, *COTERM*. Be sure to get this one if you use Delphi's conference area a lot. It offers a *split screen* to make it easy to compose your outgoing messages.

Also present are some patches for *Mikeyterm 4.0* to allow you to use its auto-dialer function (control 3) with a Hayes modem. Thanks once again to Mike Ward, its author.

### Utilities

There is now a full set of Intel Hex to CoCo binary, and vice versa, utilities in this topic area, along with a full description of just what Intel Hex is. I wrote and uploaded this. Keith W. Smith (UGLY) has uploaded the *Ugly Wordprocessor*, a simple line editor for quick jobs. Cray Augsburg (RAINBOWMAG) has uploaded some tax preparation utilities (*TAX*), a pie chart utility (*PIE*), and some other new files as well.

### Games

Cray Augsburg has submitted a number of new games from RAINBOW's collection. (None of these has appeared in the magazine, however.) And Stephen Macri has submitted a very clever golf Simulation.

### Assembly Language

Don Hutchison has uploaded source code for three neat little ditties. *NUTRAX* formats an extra five tracks on 35-track CoCo disks without hurting existing information (great for hackers moving up to a 40-track version of Disk BASIC). *Color Zoom* is a visually pleasing bit of clever code that the authors of *Graphicom* got from an old CoCo game, modified and gave to me. I gave it to Don, and he commented it and turned it into a good assembly language tutorial.

### Product News and Reviews

In this database topic are reviews of the latest Radio Shack games, *Pegasus*, *Donpan* and *Pitfall II*, and a report on the DS69A Video Digitizer. Also in this section is my reply to RAINBOW regarding their review of a newly released EPROM programmer.

I have a review of the VIDCODIT video digitizer, a \$40 bare board kit sold by Dick Kinney that does a rather fine job of digitizing a video signal, though it is pretty hacker-oriented. Buried in that review are three digitized pictures of me, taken as samples of the performance of the unit.

### OS-9

We have a description of how to make the Version 2.0 OS9 CO80 driver work with the DISTO 80-column card.

Greg Forseth has given us some RAM disk software for OS-9 and the Banker 256K expansion.

Rob Wyatt (ROBERTJR) has uploaded a pause utility command.

### Coming Attractions

Look for more product reviews, including one of the Tandy Hard Drive Controller and Drive for the CoCo. And look for a *Kermit* supporting terminal program in the Data Communications section of the database. In hardware, I hope to soon have a sophisticated, all-machine language driver program for the Green Mountain Micro Color Burner, complete with point-and-pick menus and bar graph displays of what percent of the EPROM is programmed. And, in Graphics, more pictures and more *Graphicom* font screens.

Coming soon to the Graphics section is a superb dedicated *Fat Bits*-type screen editor, one that has a mode in which you can do "fat bits" (enlarged) editing of artifact color screens with the magnified pixels appearing as red, blue, white or black on your screen. The total area shown in the magnifier is larger than in any other graphics editor's "fat bits" program, and the ease of use of this utility is good.

Soon, I will release my *C64-to-CoCo Converter*, a program that allows CoCo owners to download Commodore 64 *Doodle* format files, then view them on their CoCos. We will show a few representative converted *Doodle* art files, and you will be able to find many more on the Micro Artists (MANIAC) SIG on Delphi.

In the Data Communications topic area on our CoCo SIG, we hope to soon have the complete *WEFAX* program set and the full documentation for it and, later on, possibly some interface-less RTTY/CW software as well. (This last by the authors of *Graphicom* and *WEFAX*.) We may later feature a number of tutorial files in our assembly language database for beginning and intermediate ML hackers.

There has been a heavy emphasis on graphics in this report. This is due in part to my own great interest in this area. Remember, we welcome submission of all material. I will try to develop other areas now that the Graphics section is off to a good start. We cordially invite you to submit your favorite original or public domain programs, pictures and music to share with the CoCo Community. And, please feel free to speak up and share your thoughts about products you buy or reviews you read.

— Marty  
(MARTYGOODMAN)  
Delphi CoCo SIG Database Manager





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# Investigating the CPU

By Tony DiStefano  
Rainbow Contributing Editor

If you have been following the past several articles, you are familiar with how a memory chip works. A memory chip by itself is not useful and a Printed Circuit Board (PCB) full of memory chips cannot do much. We need something that can write to and read from this memory. What we need is a CPU. What is a CPU? It's a Central Processing Unit.

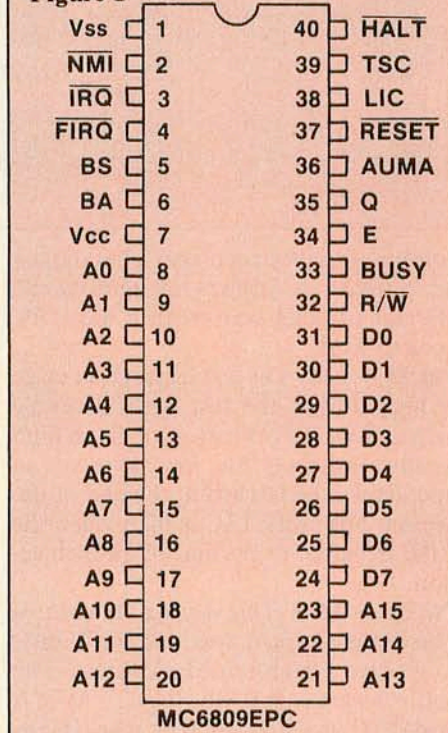
This chip is the workhorse of the computer. It does just about everything. In the CoCo, the CPU is made by Motorola. The part number for this chip is MC6809EPC. The "MC" stands for the company, the "6809" is the part number, the 'E' means it's driven by an external clock and the "PC" means it is a plastic package.

It's common knowledge that the 6809 is one of the most powerful eight-bit CPUs made. In fact, some people argue it is *the* most powerful. Whatever the case, we're going to dig into it and look at it from a hardware point of view.

The most important thing to know about this chip is the pinout. The 6809 is contained in a 40-pin DIP (Dual Inline Package) the same size and shape as the VDG, PIA and SAM chips also in the CoCo. Figure 1 shows this 40-pin chip and the pin names. The following is a pin-by-pin description of the 6809.

*Tony DiStefano is well-known as an early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.*

Figure 1



**Pin 1 — Vss.** This is the ground pin to which all signals are referenced. It has a potential of zero volts.

**Pin 2 — NMI.** This normally high (five volts or logic state of one) input triggers on the negative edge of a pulse. This in turn requests that a non-maskable interrupt sequence be generated. A non-maskable interrupt (as the word indicates) cannot be inhibited by the pro-

gram. It also has a higher priority than FIRQ, IRQ or software interrupts.

During recognition of this NMI, the entire machine state is saved on the hardware stack. After a reset, an NMI is not recognized until the first program load of the hardware stack pointer. The pulse width of the NMI low must be at least one E-cycle long before it is recognized.

**Pin 3 — IRQ.** This input triggers in the same way as the NMI except it initiates an interrupt request, providing the IRQ bit in the CC (Condition Code register) is clear. This also saves the entire machine state on the stack. The IRQ has a lower priority than the FIRQ. It is up to the service routine to clear the source of the interrupt before doing an RTI (Return from Interrupt).

**Pin 4 — FIRQ.** This input, like the IRQ, initiates a fast interrupt request, providing the FIRQ bit in the CC is clear. This has higher priority than the IRQ, but only saves the CC register and the program counter on the stack. The interrupt service routine should clear the source of the interrupt before doing an RTI.

**Pins 5 and 6 — BS (Bus Status) and BA (Bus Available).** Two outputs that work together to generate the condition of the CPU. When BS and BA are both low, a normal or running condition exists. When BS and BA are both high, it indicates the CPU is in the halt mode. When BS is high and BA is low, an interrupt or reset is acknowledged. And



finally, when BS is low and BA is high, the CPU is in a sync acknowledge mode.

**Pin 7 — Vcc.** This input powers the CPU with five volts.

**Pin 8 to 23 — A0 to A15.** These 16 pins are used to generate one of 65,535 different address locations the 6809 CPU can access for data transfer. When the processor does not require the bus for a data transfer, it sends out all that is on the address bus. The R/W line equals one, but BS equals zero. This is known as a dummy access or VMA cycle. All addressed bus lines go into a high-impedance state when BA is high or when TSC is driven high.

**Pin 24 to 31 — D7 to D0.** These eight bi-directional pins are used to transfer data to and from the CPU and other devices connected on the data bus.

**Pin 32 — R/W.** This output signal indicates the direction of the data transfer on the data bus. A low indicates the CPU is writing data to the data bus. A high means the CPU is reading. When BA is high or when TSC is high, the output is made high-impedance.

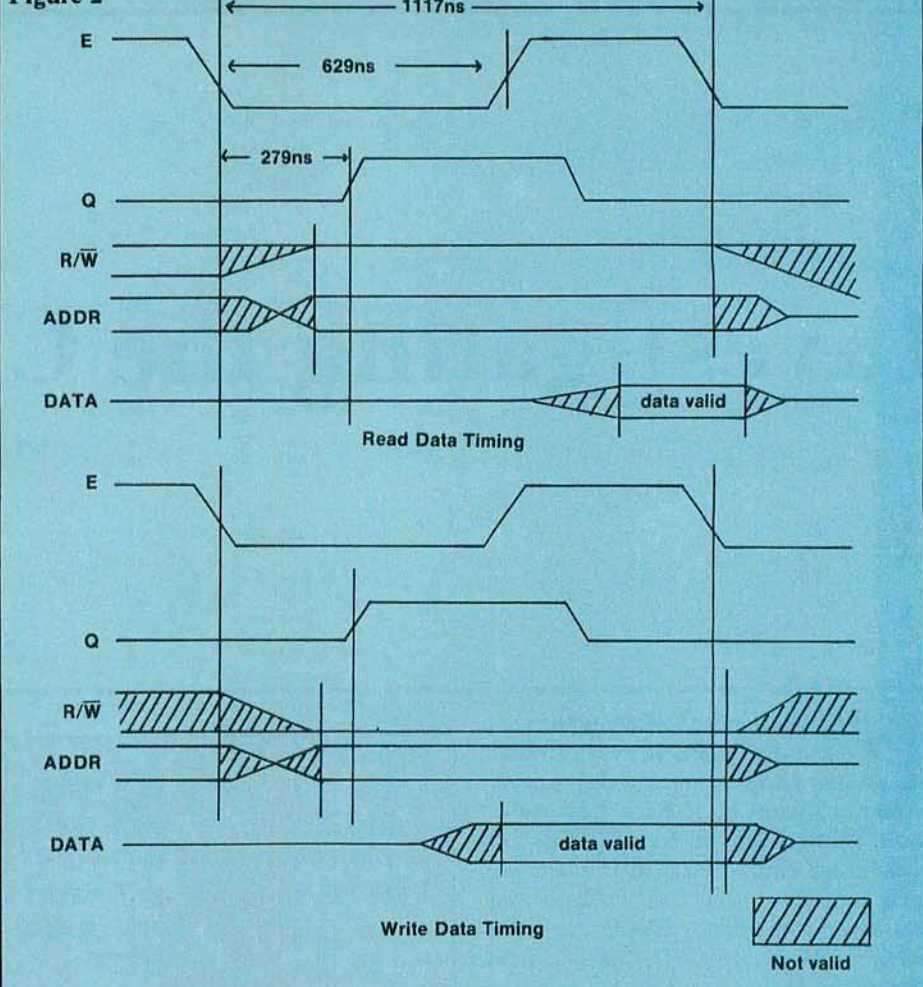
**Pin 33 — BUSY.** This output-pin signal indicates that bus re-arbitration should be deferred. Wow, what a mouthful! This means BUSY is high for the first two cycles of any instruction that first reads, then writes new data, high during the first byte of a double-byte access, and during the first byte of any indirect access.

**Pin 34 and 35 — E and Q.** These clock signals are required only by a 6809 that has an 'E' prefix. In the CoCo, these signals are generated by the SAM (MC6883) chip. These signals bring the CPU to life. The 'Q' clock must lead the 'E' clock. Addresses are valid after the falling edge of the 'E' clock, and data is latched from the bus by the falling edge of the 'E' clock. More on 'E' and 'Q' clocks later.

**Pin 36 — AVMA.** This output is the advanced VMA signal and indicates the CPU will use the bus in the following bus cycle. The predictive nature of the AVMA signal allows efficient shared-bus multiprocessor systems. When the CPU is in either a halt or sync state, the AVMA is low. The CoCo does not support this feature.

**Pin 37 — RESET.** A low on this normally high input forces the CPU into a reset condition. The reset vectors are loaded into the program counter from locations \$FFFE and \$FFFF, then the CPU begins to execute the instructions it finds. Because the reset threshold

Figure 2



voltage is higher than that of standard peripherals, it ensures all peripherals are out of reset state before the CPU goes to work.

**Pin 38 — LIC.** The last instruction cycle is high during the last cycle of every instruction, and its transition from high to low indicates the first byte of an opcode will be latched at the end of the present bus cycle. LIC is high when the CPU is halted at the end of an instruction.

**Pin 39 — TSC.** This three-state control causes the address, data and R/W lines to go into a high-impedance state. The control signals BA, BS, BUSY, AVMA and LIC do not go into the High-impedance state. To force the CPU into this state, TSC must be made high just before the end of the previous cycle. To regain access, TSC is brought low and the clocks for that processor restarted when the addresses become valid.

**Pin 40 — HALT.** A low level on this input pin causes the CPU to stop running at the end of the present instruction and remain indefinitely without loss of

data. When halted, the BA output becomes high, indicating the buses are free. While stopped, the CPU does not respond to external requests, although NMI or RESET will be latched for later response. During the halt state the 'Q' and 'E' clocks must continue to run normally.

Figure 2 is a diagram of the timing information of a read cycle and write cycle for memory or peripherals.

The complete read cycle for the CoCo is about 1,117 ns (nanoseconds) long. The cycle starts with the falling edge of the 'E' clock. Some 200 or so nanoseconds later, the address bus is stable. That means the bus holds a valid 16-bit address. At the same time, the R/W line is stable with a logic level of one. A little later, about 80 ns or so, the 'Q' clock changes to a high condition. But for now, it is not very important.

The next change is the 'E' clock. About 629 ns after the 'E' clock falls, it rises again. This change is important but I'll get to that later. Next, the 'Q'



clock falls to a zero state. Now, most important, when the falling edge of the 'E' clock occurs, the data on the data bus is transferred into the CPU.

There is a small catch: the data must have been valid (stable and not changing) 80 ns before the falling edge of the 'E' clock. It is up to the memory device or peripheral to make sure the data is there on time. The CPU does not wait; if the data is not there on time, wrong data is entered into the CPU.

The second part of Figure 2 is a write cycle. The complete write cycle is the same length as the read cycle, approximately 1,117 nanoseconds. Again, everything starts with the falling edge of the 'E' clock, and again the address bus is stable with a 16-bit address. This time the R/W line is stable with a logic level of zero. The 'Q' clock rises and the 'E' clock rises; the 'Q' clock falls and the 'E' clock falls. But this time, the CPU supplies the data.

The data is valid no later than 200 ns after the rising edge of the 'Q' clock, which occurs just before the rising of the 'E' clock. The data stays valid until about 20 ns after the falling edge of the 'E' clock. In that time, the memory of the peripheral device must take the data from the data bus. Then another cycle starts. The CPU decides whether it is a read or a write, depending on what it's doing next.

How the CPU decides depends on what it did in the previous cycle. When the computer is first turned on, the reset

line keeps it from doing anything until everything stabilizes. When the reset line starts the CPU going, it always does the same thing — two reads. These two reads are always at the same place, \$FFFE and \$FFFF. This is the reset vector, which is a pointer that points to a memory location. Because the 6809 can access 65,535 bytes of data (16 bits), the pointer must be exactly 16 bits long. Since the 6809 can access only eight bits at a time, the pointer must be two bytes long.

After the CPU reads these two bytes, it places them in an internal register called the program counter. This program counter always points to the CPU's next instruction. The CPU reads the first instruction. Instructions in the 6809 can be one to four bytes long, so the CPU has to read zero to three bytes more depending on the instruction. After the complete instruction has been read, the CPU acts on it. This instruction could be read data, write data or do something internal. Whatever the case, the CPU continues to read and write until turned off.

Now we know how a CPU accesses devices on the bus. It's time to join the CPU and the memory chips discussed in previous articles.

For example, let's use an 8K memory device. This could be a ROM or a RAM chip. It has 13 address lines, A0 to A12. Two to the power of 13 is 8K. Since the CPU can access 64K, eight of these memory chips can be used. But how?

Some sort of decoding has to be set up. If we hook up the first 13 address lines to the CPU, we are left with three unused lines.

Now, we can use a three to eight decoder chip (explained in an earlier article). If we connect the three unused address lines of the CPU to this decoder, we have eight individual address locations. In turn, these eight lines can be used to control the chip enable lines of eight 8K memory devices. That brings our total to 64K of memory. Mixing the 8K devices between ROM and RAM would give us a complete computer. Well, almost.

Eight chips of memory do not a computer make. It needs a little more than that. Things like a keyboard, video, drives and joysticks are a must on a computer. These connect a computer to the real world. But these things are not as complex as you might think. They are just more devices connected to the CPU via address lines, data lines and control lines.

For instance, the keyboard is simply a bunch of switches and, through a device called a PIA (Peripheral Interface Adapter), the CPU monitors the switches and interprets them according to the software. Each switch represents a letter of the alphabet or a number. That's all. PIAs and other I/O devices take up little room in a memory map. A PIA only takes up four bytes. More decoder chips are needed in order to map it properly, but the same theory is used.

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# PIPELINE

**SIX SHOOTER** Tactical Electronics Corporation now offers an automatic parallel interface printer switch that lets up to six computers share one printer. It supports computers using a Centronics-type parallel port. The switch, which is available for under \$500, is invisible to applications, allowing use with word processors and graphics screen dumps. Each connected computer is prioritized. If a shared printer is in use, the switch appears to be an offline printer to the computer. Switching is automatic and there is no data loss during switchover. Also, an automatic line feed can be provided for computers if necessary. *Contact Tactical Electronics Corporation, P.O. Box 1743, Melbourne, FL 32902, (305) 676-6907.*

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**EDUCATED CABLE** The new User Programmable Interface Cable presents a solution to RS-232 asynchronous interface problems. The user may select, via DIP switches on the male-to-male cable, configurations covering 95 percent of applications. The DB25 cable is priced at \$19.95 and is available in a 10 foot length. *Contact Craig Data Cable Co., 652 Glenbrook Road, Stamford, CT 06906, (800) 243-5760 (in Connecticut call 203-356-9315).*

\*\*\*

**BBS DREAM** A new BBS package is under development for the CoCo by Software Interphase, Inc. The *SysLink* system is to support TeleLink Networking for private and public messages; *MicroMatch* for on-line computer dating; *FileMail* for sending private files to other users; *SuperVote* for surveys and polls; and much more. Also provided with the package will be manuals the SysOp may sell to system users. *Contact Software Interphase, Inc., 5 Bradley Street, Providence, RI 02908, (401) 274-LINK (voice) or (401) 272-1138 (300/1200 Baud).*

\*\*\*

**TWO-PORT BUFFER** Proteus, a parallel two-port buffer that supports hardware or

software switching of ports, is now available from Computer Friends. Proteus features multiple-copy capability on each port as well as flexible capacity buffering. This means each port is given as much memory as available. Cost is \$199 for the 64K version and \$299 for the 256K version. *Contact Computer Friends, Inc., 6415 SW Canyon Ct., Portland, OR 97221, (503) 297-2321.*

\*\*\*

**FREE OFFER** Falcon Safety Products, Inc. has announced the availability of a free 16-page illustrated guide on preventive maintenance techniques for computers and other electronic office equipment. The booklet guides the reader through proper maintenance using products from the Falcon line of care products. Topics covered include dust removal, static control, platen restoration and safety measures. *Contact Falcon Safety Products, Inc., 1065 Bristol Road, Mountainside, NJ 07092.*

\*\*\*

**PUBLIC DOMAIN** CompuServe has placed specifications for the asynchronous 'B' protocol file transfer program into the public domain. Protocol features include interrogation of remote computer characteristics such as transfer capabilities, cursor addressing and graphics modes, as well as host initiation of file transfers in either direction. The specification documents and C language sources for the generic implementation can be downloaded free of charge from the CompuServe Information Service.

\*\*\*

**PROTECTION** Reuters News Service has reported that radiation emitted from computer monitors and televisions may be harmful. To combat the effects of the offending rays, RAM has introduced CRT Shields. Priced from \$29.95, these shields are manufactured with lead and chemically treated to filter out harmful radiation. The non-glare shields also include a lifetime

warranty. *Contact RAM, 8306 Wilshire Blvd., Suite 10, Beverly Hills, CA 90211, (800) 227-2001 (in California call 800-537-2001).*

\*\*\*

**BOOKWORM** Howard W. Sams & Co. has recently introduced *Computerfacts* technical service data manuals for seven Tandy/Radio Shack products. These manuals provide the repair data necessary for service and maintenance of computer equipment. Included in the manuals are schematics, wave form photos, trouble-shooting tips and replacement parts lists. Priced from \$19.95, the manuals are available for, among other Tandy products, the CoCo and CoCo 2 as well as the DMP-110 printer. *Contact Howard W. Sams & Co., 4300 W. 62nd Street, Indianapolis, IN 46268, (317) 298-5400.*

\*\*\*

**ALSO . . .** Howard W. Sams & Co. has released 68000, 68010, 68020 *Primer* — a book written to introduce novice or experienced programmers to the instruction set and addressing modes of the 68000 family. The book covers architecture of the chips, how to program in assembly language, code-mapping and how the chips are used in multi-user systems. For more information write to the address given above.

\*\*\*

**COVER UP** Mousetop, the mouse cover with a "country look," has set out to give personality to computer "mice" nationwide. This cover fits most computers' mouse devices. Made from silver/gray fur, Mousetop comes in two varieties. One is slightly near-sighted and wears wire-rimmed "granny" glasses, and the other has 20/20 vision. The washable Mousetop is designed to protect your mouse from the grime of daily use. It retails at \$5.95 with glasses and \$5.49 with 20/20 vision. *Contact H&H Enterprises, Box 2672, Corona, CA 91718, (714) 737-1376.*



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OS-9  
DRIVER  
\$24.95

The first 256K/512K memory bd for the CoCo II! Inside this low noise metal case lives 256K/512K of memory and all the circuitry to access it as a RAMDISK! Compatible w/all CoCo II's even 26-3127 & 26-3134A/B (see June '86 Rainbow Review)

256K **THUNDER RAM** 256K

## STRIKE 1 - RAM!

(NOT available for CoCo II's)

★ ★ ★ ★ ★ ★ ★ ★

Thunder Dupe 2 - Format & Backup a FULL diskette (68K) in ONE PASS! Up to 4 Disk Drives!! \$24.95

★ ★ ★ ★ ★ ★ ★ ★

OS-9  
DRIVER  
\$24.95

The first 256K memory Bd for the CoCo! Load four 32K pgms at once, emulate a 40trk RAMDISK, 60K Print Spooler, FAST access, 30+ Hi-Res screens in memory!! \$99.95 (see Sept '85 Rainbow Review)

DOUBLE RAM - Upgrades a THUNDER RAM from 256K to 512K giving TWO independent RAM Disks! \$79.95

NEW VERSION **COCO MAX II** NEW VERSION

## STRIKE 3 - A HIT!

Feature packed hardware & software Graphics System! Includes: Pull-Down Menus, Icon processing, multiple Font styles, full graphic editing plus a special Input Module for 256x192 joystick input. 64K DISK \$79.95 w/Y-Cable \$99.95  
Requires Multi-Pak or Y-Cable (\$29.95)  
CoCo Max I - II Disk Upgrade - \$19.95  
CoCo Max (TAPE) \$69.95 Mouse Pad \$14.95

10 MEG **SUPER DISK** 20 MEG

## GRAND SLAM!

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Tony Di Stefano (Turn of the Screw Guru) has done it again!!! Coming soon is SUPER DISK - a HARD DRIVE adapter that will fit inside the Super Controller or Super Ram. It will be able to access one or two FIVE, TEN or TWENTY MEGABYTE Hard Disk Drives. Write for more exciting details!

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

**SUPER CONTROLLER**

## STRIKE 2 - DOS!

Uses 2764 (\$6.95) EPROM Programmer  
or 27128 (\$14.95) ↓ \$59.95 ↓

EPROMS!

(Requires Super Controller)

The most AMAZING CoCo Disk Controller ever! Switch up to 4 DOS's (up to 16K) via a single software POKE! Choose between R/S 1.0/1.1, Spectrum DOS, ADOS, JDOS, Stearman DOS - \$99.95

Spectrum DOS \$29.95 and/or ADOS \$39.95 w/purchase of Super Controller (Buy 'em both for \$59)

Enhanced Display 80 - Add an 80x24 display, Real Time Clock & Centronics Parallel Printer interface to your Super Controller! Includes SMOOTH SCROLLING & Switchable Video Input!! \$129.95  
NEW! OS-9 Driver for Display 80 \$24.95

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**COD Order Line 718-441-2807**



# SPECTRUM PROJECTS

## SOFT AND HARD WARES FOR COLORFUL COMPUTING

### COMMUNICATION

**COLORCOM/E** - A complete smart terminal package! Upload, Download, Hi-Res (51X24) screen, 300/1200 Baud, Offline Printing, 32/64K Disk\* - \$39.95  
\* - Now with **DELPHI & Compuserve XMODEM** support! Download ML! **COMPUSERVE** 5hr Start Kit \$29.95

SAVE \$20!  
Get  
CC/E TW-64  
TELEPATCH  
for only \$99.95

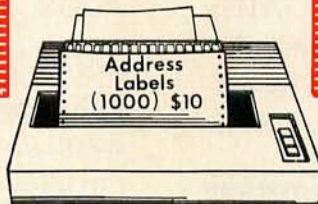
### WORD PROCESSING

**TELEWRITER-64** - Three Hi-Res screens, true lowercase char's right justify, full screen editor. Tape \$49.95 Disk \$59.95  
**TELEPATCH** - A TW-64 enhancer!!! True block move, Overstrike & TSPool mode, Type Ahead Buffer  
**FASTER** Disk I/O 64K Disk \$19.95

BUY BOTH  
SAVE \$10

### MODEMS

**MODEM** - 300 Baud - \$59.95\*\*  
**UNITECH** Modem Phone - \$79.95\*\*  
**J-CAT** Modem - Lowest priced auto/answer modem - \$119.95  
**HAYES SM300** - "Programmable" auto-dial/auto answer-\$169.95\*\*  
Hayes "CLONE" 1200 Baud-\$199.95\*\*  
\*\* - Add \$12.95 for Modem Cable

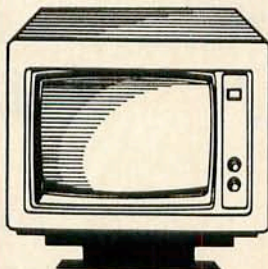


### PRINTERS

**GEMINI 10X** - closeout \$179.95  
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**CoCo Keybd Software** - Finally! An ENHANCED Function Key Pgm! 4 most wanted features: 9600 Baud Poke, Text Screen Dump, Line Listing & Cold Start-DSK \$14.95



Monitor Stand \$24.95

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**SAVE \$10**

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OFF TELEWRITER-64 WITH ANY PRINTER,  
KEYBOARD OR MONITOR

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# SPECTRUM PROJECTS

## SOFT AND HARD WARES FOR COLORFUL COMPUTING

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Competition	DYNACALC
Screen 32X16	51X24
Precision 9 digits	16 digits
Hi-Res Graphics NO	YES
Visicalc cmd format NO	YES
New low price! 64K Disk \$69.95	
Side Wise -Print DYNACALC files up to 255 chars-sideways! \$24.95	

**NEW LOW  
PRICES  
FOR '86**

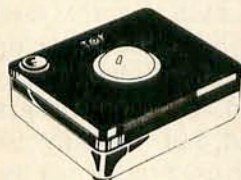
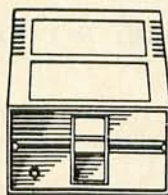
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\* PLUS: controller-manual-cable



### GAME CONTROLLERS

**Wico Command Adapter** - Now you can hookup 2 Atari type joysticks to your CoCo for only \$19.95!  
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Want to upgrade your new \$69/\$88 CoCo II? (See below !!)  
**4464 DRAMs** - two chip 64K upgrade for 26-3134A and 26-3134B Korean CoCo II's ..\$39.95  
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#### DISK SOFTWARE \*\*

Buy any 2 - Save 10%  
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Buy any 4 - Save 20%

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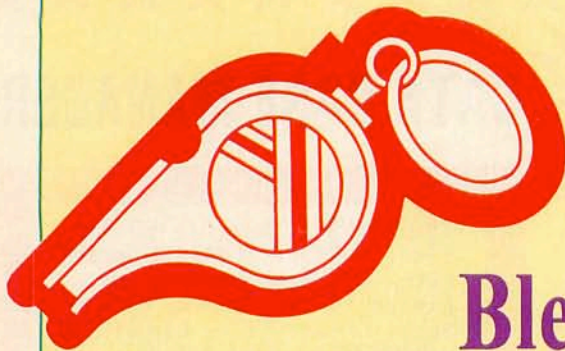
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FREE - Send for our CoCo catalog flier !!!  
Dealer inquiries invited !  
Software submissions welcomed !

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*This bundle of subroutines can lend audio effects to any program*



## Bleeps, Bloops, Bells and Whistles!

By William Mitchell



**T**his program, *Soundbase*, represents an inventory of sounds used in games and educational programs I have written. They have been developed over several months and saved so they can be appended to any program, then called for subroutines as needed. When the program is completed, the unused subroutines are deleted, but I usually use all of them in most programs. *Soundbase* can be used to form a basis for many programs.

(Editor's Note: Unplug the disk controller, if you have one, before loading the program.) ☐

*Dr. William Mitchell is a gynecologist trained at the University of Alabama Medical Center in Birmingham. He is a self-taught programmer who enjoys experimenting with the features possible with the 6809 chip. He has four children and lives in Enterprise, Alabama.*





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## A CHIP OFF THE OLD...

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6809E & SAM (Be Prepared!!!) ....\$59.95  
64K CoCo II - w/NEW keyboard ....\$149.95  
Eprom Prgmr (2ms speed/2K - 16K)..\$149.95  
Tandy1000 512K Upgrade-SAVE \$350..\$169.95

## COCO LIBRARY...

A History of the CoCo / 1980-1986 ..\$3.95  
CoCo Memory Map .....\$14.95  
Basic Programming Tricks Revealed..\$14.95  
The FACTS - Inside "guts" of CoCo..\$16.95  
500 Pokes, Peeks 'N Execs .....\$16.95  
Basic 09 Tour Guide .....\$19.95  
Assembly Language Programming ....\$19.95  
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Extended Basic Unraveled .....\$19.95  
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Complete 3 Book Set - Save \$10! ..\$49.95

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PBJ WORDPAK-RS HiRes 80x24 displ ..\$99.95  
Micro Works DS-69A Digitizer ....\$149.95  
Tandy 1000 2nd Drive (SAVE \$40) ..\$159.95

\* - Specify CoCo II Catalogue Number

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w/95% accuracy & 64 Voice Prints! ..\$99.95  
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Amdek Twin 3" Drvs w/controller ..\$249.95

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**SPECIAL 64K RAM CHIPS \$19.95**





# COLORFUL UTILITIES



## COCO CHECKER \*

Something possibly wrong with your CoCo??? CoCo CHECKER is the answer!! Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-Pak Interface and more!! 16K TAPE/DISK **\$19.95** (see Jan '85 Rainbow Review)

## MULTI-PAK CRAK

Save ROMPAKs to your 64K Disk system using the RS Multi-Pak Interface. Eliminate constant plugging in of ROMPAKs now by keeping all your PAK software on disk. Includes POKEs for "PROBLEM" ROMPAKs- including the NEW 16K PAKS! (Demon Attack, Dragons Lair, etc) 64K DISK **\$24.95**



## TELEPATCH II

All the FEATURES of TELEPATCH plus the classically proportioned characters of the WIZARD (\$19.95) font w/TRUE lowercase descenders! Get BOTH & SUPERCARGE your TW-64 for only **\$29.95**

## SPIT 'N IMAGE

A super upgrade from Disk Omni Clone! Back everything up! This amazing program handles "non standard" disks with ease. We haven't found any disk yet that it can't handle. Don't ever be caught without a backup again! Lowest price too! Beats most "copy protection" programs! 32K DISK **\$29.95**

## COCO SCREEN DUMP

The best screen dump program for the Panasonic, Epson & Gemini printers ever! Have the option of standard or reverse images w/regular or double sized proportional pictures. 600-9600 Baud too! A must for Graphicom and CoCo Calendar users. 16K TAPE/DISK **\$19.95** (see Nov '84 Rainbow Review)

## DISK UTILITY 2.1\*

A multi-featured tool for USER FRIENDLY disk handling. Utilize a directory window to selectively sort, move, rename and kill file entries. Lightning fast Disk I/O for format, copy and backup. Examine contents of files, the Granule Table, plus the size, load addresses and entry points of all programs. Single command execution of both Basic and ML programs. 32K/64K DISK **\$24.95** "Disk Utility has proven itself very quickly at my house" - Ed Ellers Oct '84 Rainbow Review pg. 220



## SPECTRUM FONT GENERATOR

Now you can write files using any CoCo Word Processor (Telewriter-64, VIP Writer, etc.) and convert them to special Highly Detailed character sets! Some of the character sets supported are Italics, Old English, Futuristic and Block. A character set editor is included to create custom sets or modify existing ones! Supports most dot-matrix printers! DISK **\$29.95** (see Dec '85 Rainbow Review)

## SPECTRUM DOS

Add 24 NEW Disk commands with 2 Hi-Res screens! Supports 40 track & Double-Sided drives, 6 ms stepping, auto disk search, error trapping & "EPROMABLE". 64K DISK ~~\$49.95~~ New LOW price!! **\$24.95**

## SCHEMATIC DRAFTING PROCESSOR

Save time and design pro looking diagrams using a 480X540 pixel worksheet w/6 viewing windows. Over 30 electronic symbols w/10 definable symbols. (Even Logic gates & Multipin chips!) Print hard copy and save to disk. 64K DISK ~~\$49.95~~ New LOW price!!! **\$29.95** (see Jan '84 Rainbow Review)



## BASIC+

Basic+ provides (23) of the most used BASIC cmds w/one keystroke plus scrolling & editing w/single key! Also included is a 32 character typahead BUFFERED keybd w/auto key & repeat plus a 32K Print Spooler & Ptr Echo!! 64K DISK **\$29.95** (see Jan '86 Rainbow Review pg. 192)

## COCO CHECKBOOK

Use your CoCo to keep track of your checking and savings accounts! Printout individual personal checks! 32K/64K TAPE **\$29.95** DISK **\$39.95** (see April'85 pg. 210 & Oct'85 pg. 197 Rainbow Reviews)

**\* NOW AVAILABLE BY EXPRESS ORDER AT YOUR LOCAL RADIO SHACK STORE -**

#90-0289 COCO CHECKER - #90-0290 DISK UTILITY 2.1



**BUY ANY 5 PROGRAMS  
GET A DRIVE FOR \$159.95 !\***

\* - No other discounts can be applied.



**DEMAND TO SEE THE  
R/S DEMO DISKS !  
(FC#0249 & FC#0919)**





# COLORFUL UTILITIES



**NEW!**

## COCO TEXT UTIL

Includes utilities that most CoCo word processors (TW-64, VIP Writer, etc.) leave out! Reset margins to correct length for uploading, convert all UPPER CASE text to mixed upper/lower, display total BYTE count, EASY rename & kill functions! DISK **\$19.95** (see May '86 Rainbow Review)

## COCO VIDEO TITLER

Start your VCR tapes with dazzling title frames followed by professional countdown to black fade-outs! Use a title page editor with several sizes of text & background colors! 16K TAPE **\$19.95**

## PENPAL

It's here! CoCo's answer to 1-2-3! PENPAL combines Word Processing, Communications, Graphics, Data Base & Spread-sheet into a single integrated software package! 64K DISK INTRO PRICE **\$69.95**

## 64K DISK UTILITY PACKAGE

Take advantage of an expanded 64K machine. Make an additional 8K of RAM available by relocating the Ext Basic ROM from \$8000 to \$D800. Copy ROMPAKS to disk (even "protected" PAKS) and create a 32K SPOOL buffer for printing. DISK **\$21.95** (see July '83 Rainbow Review)

## TAPE/DISK UTILITY

A powerful package that transfers tape to disk and disk to tape automatically. Does an automatic copy of an entire disk of programs to tape. Ideal for Rainbow On Tape to disk. Also copies tape to tape & prints tape & disk directories. TAPE/DISK **\$24.95** (see Sept '83 Rainbow Review)

**NEW!**

## SUPER DUPER UTILITIES

Finally! At last! A "SUPER DUPER" utility software package all rolled up into ONE!!! Includes such great utilities as: CoCo Disk Zap, Disk Encryption, Disk Mailing List, EZ Disk Master, Graphics ZOOM, Banner Creator, Function KEYS, Super INPUT/LINEINPUT, Basic Program PACKER, Alpha Directory, Basic SEARCH and much, much more!!! 32K DISK **\$29.95** (see June '86 Rainbow Review)

## COCO CALENDAR

Get organized for '86 TODAY with the CoCo Calendar! Designed for recording the entire year's occasions and daily appointments so you can plan ahead. You can store HUNDREDS of entries and our GRAPHIC Calendar will show all MEMOS! 32K DISK **\$24.95** (see Mar '86 Rainbow Review)

## THE OS-9 SOLUTION

NOW, a program that creates a "USER FRIENDLY" environment within OS-9! The OS-9 SOLUTION replaces 19 of the old "USER HOSTILE" commands with single keystroke, menu driven commands. No more typing in complex long pathnames or remembering complicated syntaxes! Set all XMODE parameters at the touch of keys! Requires OS-9 ver.01.01.00 **\$39.95** (see Sept '85 Rainbow Review)

## COCO-UTIL

**NEW!**

Now you can have the power to easily transfer Radio Shack Color Computer disk files to your MS-DOS machine - including the Tandy 1000 & IBM PC!!! You can also transfer MS-DOS files to your CoCo disk, even format CoCo disks! CoCo-Util will save you countless hours of retyping! No need to move your computer or printer anymore! Requires 128K MS-DOS computer w/2 disk drives - **\$29.95**

**NEW!**

## ➡ SOFTWARE BONANZA PACKAGE ⬅

Create an instant library of Spectrum Projects TOP Colorful Utility software. Select any of the following 12 programs to customize your own SPECTACULAR SOFTWARE BONANZA! CoCo Checker, Multi-Pak Crak, CoCo Screen Dump, Disk Utility 2.1, Spectrum Font Generator, Tape/Disk Utility, Fast Dupe II, 64K Disk Utility, Spectrum DOS, CoCo Calendar, Schematic Drafting Processor, OS-9 Solution, Graphicom, EZ Base or Blackjack Royale (a \$300 plus value) for only **\$99.95!!!**

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180 .....68  
330 .....249  
450 .....125  
650 .....193  
840 .....129  
END .....217

The listing: SOUNDBSE

```
10 ' SOUNDBASE
COPYRIGHT BY WILLIAM L. MITCHELL
104 CLUBVIEW RD
ENTERPRISE, AL 36330
NOV 1985

20 CLEAR 200
30 POKE359,0
40 GOSUB610
50 GOTO650
60 ' SOUND SUBROUTINES
70 '
BUZZER
80 FORV=30TO2STEP-2:PLAY"V31;L25
5;03;5":NEXTV:RETURN
90 '
DEPTH SOUND
100 PLAY"T2":FOR V=20TO0STEP-5:P
LAY"04;V"+STR$(V)+";L4;12"
110 FORDL=1TO20:NEXTDL
120 NEXTV
130 FORDL=1TO300:NEXTDL
140 RETURN
150 '
SIREN WARNING
160 PLAY "V30;L200;04;1;2;3;4;5;
6;7;8;9;10;11;12;05;1;2;3;4;5;6;
7;L100;8"
170 RETURN
180 '
ZAP OF VOLTAGE
190 PLAY"V20;L255;01;1;2;3;2;3;4
;3;4;5;4;5;6;5;6;5;4;5;4;3;4;3;2
;3;2;1"
200 RETURN
210 '
HISS OR FIZZ
220 PLAY"L255;01;V30;1;V5;2;V6;3
;V7;2;V5;3;V4;4;V3;5;V3;4;V4;3;V
6;4;V4;5;V5;6;V4;5;V3;4;V2;5;V3;
6;V2;7;V3;8"
230 RETURN
240 '
BLIPP
250 PLAY"L255;01;V30;1;V26;2;V22
;3;V18;4;V14;5;V12;6":SOUND 1,1
260 RETURN
270 '
280 '
SPRING
```

```
290 PLAY"02;L255;V15;1;03;V10;1;
V9;2;V8;3;V7;4;V6;3;V5;4;V4;3;V3
;2;V2;1;V1;1;2;3;2;1;2;3;2;1;2;3
;2;1;2;3;2;1;2;3;2;1;2;3;2;1"
300 RETURN
310 '
TAUNT
320 PLAY "V3;03;L16;10;10;7;12;L
8;10;7":RETURN
330 '
CHARGE
340 FORX=1TO2
350 PLAY "L4;V4;04;L16.;1;L32;1;
L16.;1;L32;1;L16.;1;L32;1;L16.;1
;L32;5;L16.;8;L32;5;L16.;8;L32;5
;L16.;8;L32;5"
360 NEXTX:PLAY"1":RETURN
370 '
BIG SPRING
380 FORV=31TO1STEP-1:PLAY"01;V"+
STR$(V)+";L255;8":NEXTV:RETURN
390 '
BOUNCING BALL
400 PLAY"T2;L255;01;V31;1;V20;1;
V10;1;P2;V9;1;P5;1;V8;P10;1;V6;P
15;1;V4;P20;1;V2;P25;1;V2;P30;1;
P35;1;P45;1;P60;1;P80;1"
410 RETURN
420 '
SIREN
430 PLAY"T255;L255;04;V1;1;2;V2;
3;4;V3;5;6;V4;7;8;V5;9;10;V6;11
;L4;12;L255;V5;10;9;V4;8;7;V3;6;
5;V2;4;3;V1;2;L1;1"
440 FOR DLAY=1TO200:NEXTDLAY:RET
URN
450 '
WOLF WISTLE
460 PLAY"T255;L255;04;V2;2;V2;2;
V3;3;V4;4;V5;5;V6;6;V7;7;V8;8;V9
;9;V10;10;V11;11;V12;12;05;V13;1
;V14;2;V15;3;V16;4;V17;5;V18;6"
470 FORDLAY=1TO100:NEXTDLAY:GOSU
B430:RETURN
480 '
MACHINE GUN
490 FORX=1TO6:PLAY"01;L255;4;3;2
;1":NEXTX:RETURN
500 '
HOORAY FOR THE RED WHITE & BLUE
510 PLAY "04;V5;L8;C;C;03;L16;A#
;A;L4;A;V5;L8;G#;A;L2;A":RETURN
520 '
FOR SCREEN DISPLAY
530 KOLOR=RND(7):PATTERN=RND(15)
540 FACTOR=128+(16*KO)+PA
550 FOR T=1TO20
560 PRINT STRING$(32,CHR$(FA));
```



```

570 NEXTT
580 RETURN
590 '
600 'TO GET SCREEN LINES
610 DIMS$(17)
620 FORX=1TO17
630 READ S$(X)
640 NEXT:RETURN
649 '
650 PG=1:SCREEN0,1:GOSUB530:PRIN
T@32, " PAGE
ONE " ;:P=98
660 FORX=1TO8:PRINT@P,S$(X);
670 P=P+33:NEXT
680 PRINT@416,CHR$(255);
720 GOTO790
740 '
750 PG=2:SCREEN0,1:GOSUB530
760 PRINT@32, "
PAGE TWO "
;
770 P=99
780 FORX=9TO17:PRINT@P,S$(X);:P=
P+33:NEXT
790 PRINT@416,CHR$(255);
800 INPUTN
810 GOSUB1060
811 IFN=8THEN750

```

```

812 IFN=17THEN650
830 ON N GOSUB 80,100,160,190,22
0,250,290,1050,490,320,340,510,3
80,400,430,460,1040
840 IFPG=2THEN750
850 IFPG=1THEN650
855 PRINTPA:PRINTPA:PRINTPA:STOP
860 GOTO750
870 DATA BUZZER-----1
880 DATA DEPTH SOUND----2
890 DATA SIREN WARNING--3
900 DATA BLAST OF LASER-4
910 DATA HISS OR FIZZ---5
920 DATA BLIPP-----6
930 DATA SMALL SPRING---7
940 DATA * SECOND PAGE--8
950 DATA MACHINE GUN----9
960 DATA TAUNT-----10
970 DATA CHARGE-----11
980 DATA HOORAY SONG---12
990 DATA BIG SPRING----13
1000 DATA BOUNCING BALL-14
1010 DATA SIREN-----15
1020 DATA WOLF WHISTLE--16
1030 DATA * FIRST PAGE--17
1040 PG=2:GOTO750
1050 PG=1:GOTO650
1060 SCREEN0,0:RETURN

```

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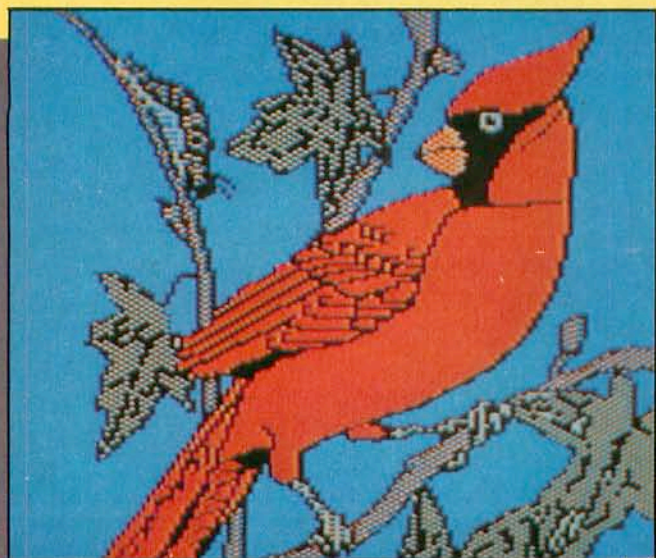
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# The CoCo Gallery



1st

PRIZE

*Harry McKinion*  
**Cardinal**

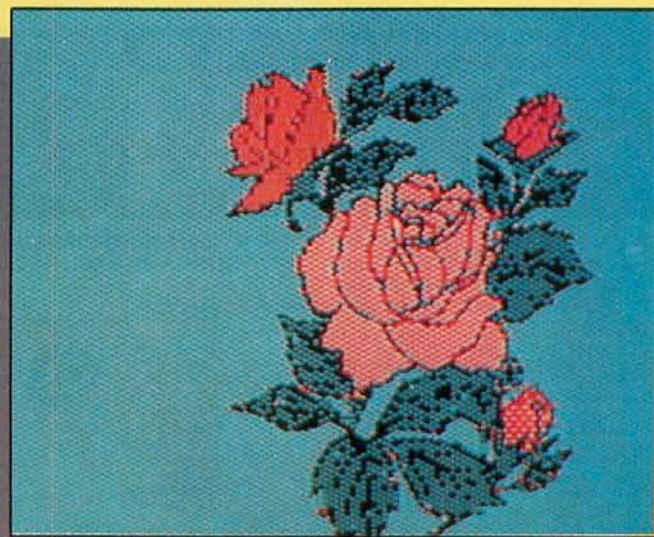
Our June Gallery opens with a familiar sight of summer, a brilliantly colored songbird heralding the end of winter. Harry lives in Semmes, Alabama and used X-Pad to create this picture.

*Clay Ambrose*  
**Rose**

June is when the roses bloom to their fullest beauty and this skillful rendition of one of nature's lovely embellishments was drawn using CoCo Paint. Clay lives in Bloomington, California.

2nd

PRIZE

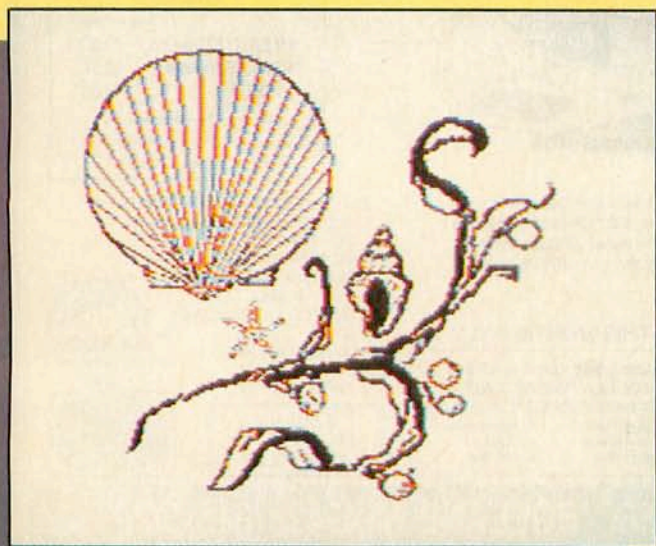


3rd

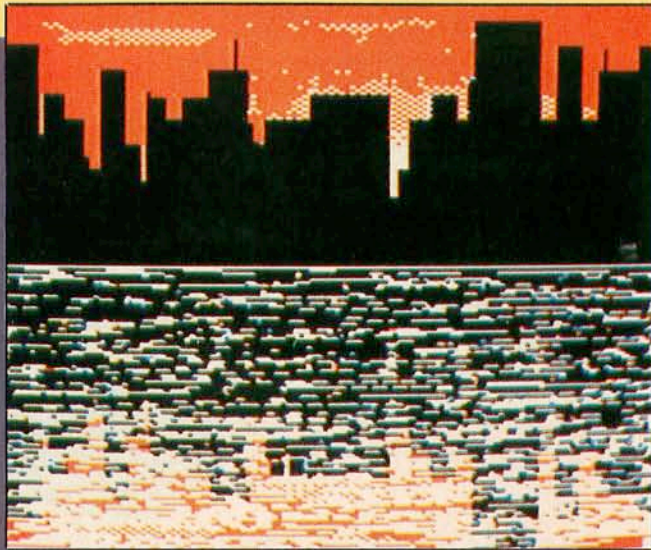
PRIZE

*Michael Wafkowski*  
**Scallop 2**

Michael lives in Elwood Park, New Jersey and used CoCo Max to create a charming arrangement of shells sure to make anyone long for the sea breezes and summer fun at the beach.







HONORABLE MENTION

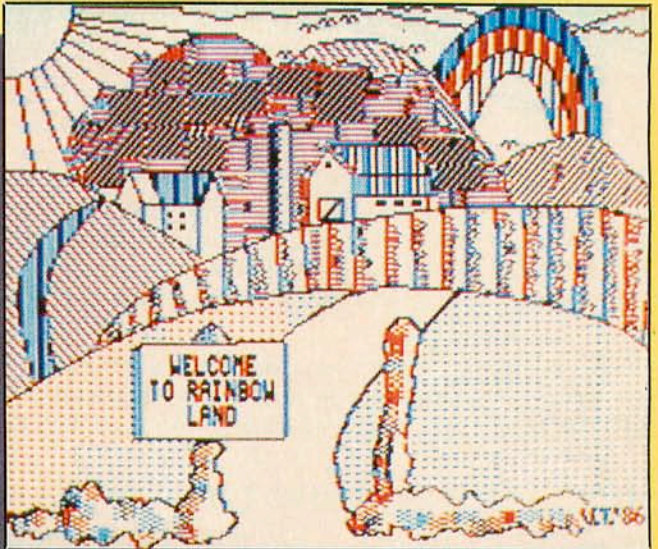
**Ken Miller**  
**Sunset**

Sundown in the city after a hot summer's day is always a welcome sight and apropos in our June Gallery. Ken lives in Yardley, Pennsylvania and used *CoCo Max I & II* for his work.

**Valerie Torres**  
**Rainbowland**

Summer is the season of daydreams and this winsome scene was drawn using BASIC. Valerie lives in Hollywood, California.

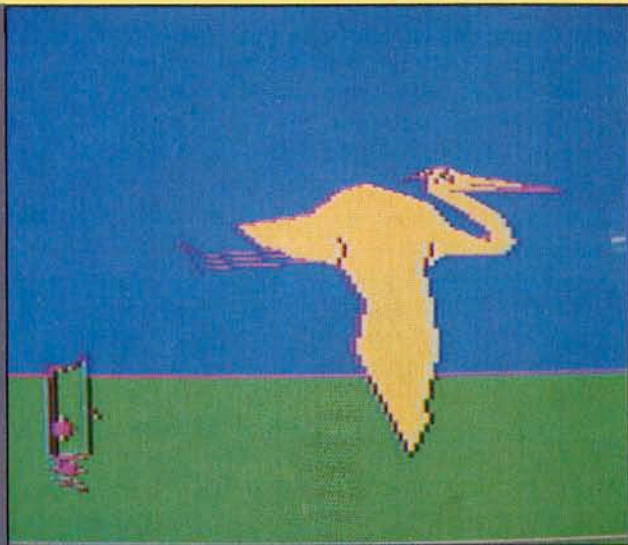
HONORABLE MENTION



**Merwyn Bly**  
**Egret**

Another seaside scene familiar to beach lovers is a lone Egret swooping around looking for the best place to wade. Merwyn lives in Vienna, Virginia and used Extended Color BASIC to draw this picture.

HONORABLE MENTION



**SHOWCASE YOUR BEST!**

You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community!

Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere.

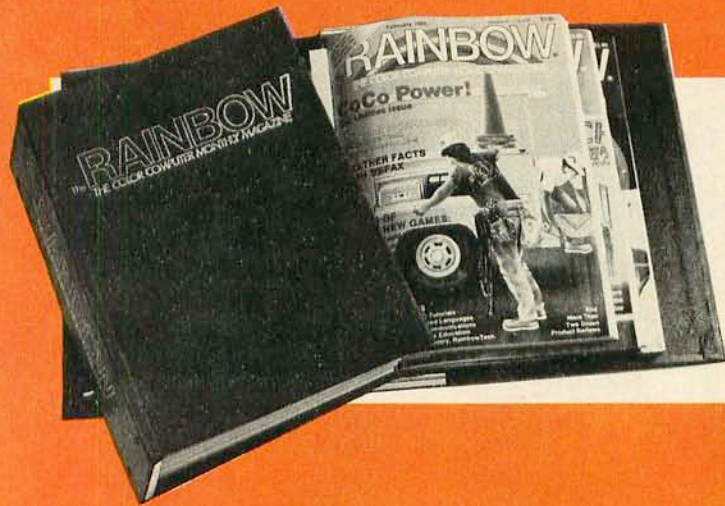
We will award a first prize of \$25, a second prize of \$15 and a third prize of \$10. Honorable mentions will also be given.

**Monica Dorth, Curator**

Send your entry on either tape or disk to:  
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THE RAINBOW  
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Attn: Monica Dorth



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*Learning another valuable Life Skill . . .*

# A Measure of Success

By Fred B. Scerbo  
Rainbow Contributing Editor

*Editor's Note: If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget that this is BASIC. All programs resulting from your wishes are for your use but remain the property of the author.*

This month's "Wishing Well" offers another Life Skills program designed to help youngsters or students sharpen a skill that is very important for everyday survival. The program, titled *Ruler*, is designed to help individuals master the detailed use of a common ruler (non-metric). Using only the commands available in 16K Color BASIC, we will create a slick program that not only quizzes these skills, but actually helps in the training and memorization required to use them.

*Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.*

## The Wish

Several years ago THE RAINBOW published a program by T. Gray called *Ruler Reader*. It was designed to help quiz the user on reading a ruler and measuring a randomly generated line on the screen. (Mr. Gray's program was based on another program called *King Komputer* by D.B. Allison in the April 1982 issue of *80 Micro* magazine.) The program was a real find for me, since I often spend much time creating from scratch most of the educational programs I need to use with my handicapped and special needs students. The students greatly enjoyed this ruler program.

There was one minor drawback to the program, however. The ruler drawn would only display a measuring stick with divisions down to an eighth of an inch. Since many of my students are involved in a graphic arts program, they are often required to have ruler reading skills down to one-sixteenth of an inch in order to accurately complete their tasks.

I resorted to making work sheets with an enlarged inch broken into 16 parts, all with the correct measurements written below. This proved to be very suc-

cessful, but many of my fellow instructors lamented the lack of a  $\frac{1}{16}$  inch program like the one that THE RAINBOW had provided.

Therefore, the time had finally come to grant a new wish: Create a ruler program that would go down to one-sixteenth of an inch and that would not only quiz, but instruct on the various parts of the displayed inch.

## The Program

The concept behind *Ruler Reading Skill* is simple. Using the low resolution graphics of the Color Computer, we create an enlarged view of one inch. I am partial towards using a completely black screen with programs such as this, using `CLS(0)`. Since the inch we draw is with white screen blocks, the black background helps to emphasize the actual divisions on the screen.

Using a set of `FOR/NEXT` loops and the `GET` command, we draw this large inch with subdivisions of  $\frac{1}{16}$  displayed. A set of subroutines is also included to label each of these marking lines as needed. This is done using screen `POKEs` so we can have reversed numbers for our fractional markings. This helps keep the consistency of the black screen. (Naturally, these `POKEs` will cause prob-



lems for those who may wish to type this into the MC-10. More on that later.) The overall look of the screen is quite effective.

One very important feature I have included in this program is the rewrite of the INPUT command using INKEY\$, which I introduced several months ago. As I mentioned then, the major drawback to the INPUT command is that it reacts to the CLEAR key and thus wipes the screen clean of any work done by the user.

---

## *"One of the best features is the review section"*

---

I am sure there are some memory POKES that disable the CLEAR key, just as there are for the BREAK key. However, there is another major advantage to using this variation of the subroutine mentioned. I have included some IF/THEN statements to have it ignore any useless keys on the keyboard. Since we only want to have our student pressing the numbers and the slash (/) to create our fractions, the letters on the keyboard have been ignored. This prevents the entry of an additional character.

For example, if the answer is  $\frac{1}{2}$ , the program would mark space  $\frac{1}{2}$  as incorrect. The space bar is one of the keys ignored for this reason. All of our possible answers in the quiz section are stored in DATA statements as strings. Therefore, the string " $\frac{1}{2}$ " and " $\frac{1}{2}$ " would not be a match. This way, we avoid needless hassle, especially with some all-thumbs individuals.

Like the original ruler program, the screen gives a random length line that must be matched against the inch displayed. No value markings appear below the lines at this point. I have also taken great care to make the line and the markings on the screen large enough and close enough together so there will

be no question as to which marking the line is matching up with.

The user must enter the correct fractional length of an inch using the numbers and the slash mark. The ENTER key must be pressed to record the answer. If the answer is correct, the screen indicates so, and places the marking labels below each inch.

If the answer is incorrect, the screen says: SORRY! TRY AGAIN: and allows another try. On the third try, the screen displays the value markings of each line. At this point, the student should be able to get the correct response. If not, the screen displays the correct answer.

The program may be interrupted at any time by pressing the '@' key and the score is displayed. Continue the quiz part of the program by pressing 'C', rerun the program by pressing 'Y' for yes, or stop by pressing 'N' for no. If you are using this program with students, I would not show them the 'C' (continue) function right away or they will be checking their score after every single problem.

One of the best features of this program is the review section, which appears at the beginning of the program. As you may recall from previous "Wishing Well" articles, I have a special pet gripe against software that claims to be educational but does not teach anything. Many programs just quiz a skill rather than teach it.

The review feature allows the student to walk through the parts of the ruler as many times as needed to be familiar with the material. The student advances through the parts of the ruler by pressing the ENTER key. After the review is complete, the screen reads:

DO YOU WANT TO TRY AGAIN (Y/N)?

Pressing 'Y' repeats the review while pressing 'N' goes directly to the quiz. You may choose to skip the review part altogether.

### **MC-10 Changes**

I have taken a little different approach this time for the MC-10 changes. If you want to type this in, make the following changes. First, leave out Line 160 and include the following lines in its place:

```
160 X$=INKEY$:MU=(-9999):IFX$
  ="R"THEN 170
161 IFX$="Q"THEN 500
162 GOTO 160
```

Next, you must change lines 390-470 to adjust for the POKE variations on the screen locations. After each POKE we need to add MU+.

I have relisted them with the corrections included:

```
390 L=0:FORI=0TO18STEP4:L=L+2:PO
KEMU+1218+I,47+L:NEXT
400 L=0:FORI=21TO31STEP4:L=L+2:P
OKEMU+1216+I,49:POKEMU+1217+I,47
+L:NEXT
410 FORI=0TO31STEP4:POKEMU+1249+
I,45:POKEMU+1250+I,45:NEXT
420 FORI=0TO31STEP4:POKEMU+1281+
I,49:POKEMU+1282+I,54:NEXT:RETUR
N
430 L=0:FORI=0TO31STEP8:L=L+2:PO
KEMU+1316+I,47+L:NEXT
440 FORI=0TO31STEP8:L=L+2:POKEMU
+1348+I,45:NEXT
450 FORI=0TO31STEP8:POKEMU+1380+
I,56:NEXT:RETURN
460 POKEMU+1384,49:POKEMU+1400,5
1:POKEMU+1416,45:POKEMU+1432,45:
POKEMU+1448,52:POKEMU+1464,52:RE
TURN
470 POKEMU+1424,49:POKEMU+1456,4
5:POKEMU+1488,50
```

They are listed here in a 32-column format to help you out. You must add one more line as well:

```
35 MC=15360
```

This helps to ensure the screen POKES are correct.

### **Conclusion**

The reactions of my students and fellow teachers have been very positive toward this latest Life Skills program. While the inspiration came from other programs, it remains unique in and of itself. I hope you find it useful.

### **Oops! Correction**

Last month I offered a program to create educational plans. I recently uncovered a small quirk that occurs when you scan through all the objectives. The program appears to end if you go all the way to the last objective. This can be solved by including a DATA line reading:

```
4338 DATA "THIS IS THE END OF
THE OBJECTIVES. RETURN TO
THE MENU."
```

This solves the problem by giving you a chance to exit. I hope no one was stymied by this little bug.

### **Next Month**

A surprise for the five-year anniversary issue! □



90	.....77
220	.....3
410	.....247
530	.....106
680	.....95
END	.....17

#### The listing: RULER

```

1 REM*****
2 REM* LIFE SKILLS INSTRUCTION *
3 REM* RULER READING SKILLS1 *
4 REM* BY FRED B. SCERBO *
5 REM* 60 HARDING AV.N.ADAMS,MA*
6 REM* COPYRIGHT (C) 1986 *
7 REM*****
10 CLS:FORI=1TO32:PRINTCHR$(220
);:NEXT
20 FORI=1TO192:READ A:PRINTCHR$(
A+128);:NEXT
30 DATA29,24,96,29,24,20,30,28,2
6,29,28,29,,,30,28,26,29,,,30,20
,30,20,30,16,20,30,,21,28,29
40 DATA21,,,21,,,26,96,24,21,,20
,16,,26,,24,21,16,22,16,,26,,26,
,16,26,,21,,20
50 DATA21,,,21,,,27,26,96,21,19,
18,,,27,19,18,21,22,16,,26,,26,
,16,26,,21,19,19
60 DATA85,,,85,,,90,24,,85,,,,,
,90,85,84,82,,,90,,90,,16,90,,,
85
70 DATA85,,,90,85,,,90,,,85,,81,,
16,90,,,90,85,,84,82,,90,,90,85,8
0,90,85,85,80,85
80 DATA87,83,90,87,82,81,91,80,,
87,83,87,,80,91,83,90,87,82,80,9
1,81,91,81,91,87,81,91,87,85,83,
87
90 FORI=1TO32:PRINTCHR$(211);:NE
XT
100 PRINT@324," INSTRUCTIONAL P
ROGRAM ";
110 PRINT@356," RULER READING S
KILLS ";
120 PRINT@388," BY FRED B.SCE
RBO ";
130 PRINT@420," COPYRIGHT (C)
1986 ";
140 PRINT@452," (R)EVIEW OR (Q
)UIZ ";
150 DIMN$(15):FORI=1TO15:READ N$
(I):NEXT:FORI=1TO64:WO$=WO$+CHR$
(128):NEXT
160 X$=INKEY$:MU=(-TIMER):IFX$="
R"THEN170ELSEIFX$="Q"THEN500ELSE
160
170 GOSUB300
180 PRINT@0,"THE LONGEST LINE ON
OUR INCH IS THE ONE-HALF INCH M

```

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By Scott Cabit

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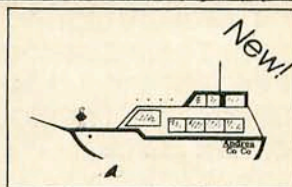
An original arcade game! Wave after wave of attacking aircraft attempt to shoot you down as you maneuver your fighter into the wild blue yonder, blasting enemy fighter, bombers, and paratroopers out of the sky. Joystick or keyboard operation. "pause game" feature. Disk version saves high scores. 32K, 100% Machine Language. See February '86 Rainbow for review.

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By Art Martin

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```

ARKING LINE. ";;GOSUB470
190 IFINKEY$<>CHR$(13)THEN190
200 PRINT0,"THE NEXT TWO LINES
ARE OUR ONE- QUARTER AND THREE Q
UARTER LINES.";;GOSUB460
210 IFINKEY$<>CHR$(13)THEN210
220 PRINT0,"THE NEXT FOUR LINES
INDICATE THEEIGHTHS OF AN INCH
ON OUR RULER.";;GOSUB430
230 IFINKEY$<>CHR$(13)THEN230
240 PRINT0,"OUR SMALLEST MARKIN
GS OF AN INCHARE THE SIXTEENTHS
OF AN INCH. ";;GOSUB390
250 IFINKEY$<>CHR$(13)THEN250
260 PRINT0,WO$;;PRINT0,"DO YOU
WANT TO TRY AGAIN (Y/N) ?";
270 X$=INKEY$;IFX$="Y"THEN170
280 IFX$="N"THEN500
290 GOTO270
300 CLS0
310 C=5
320 FORI=0TO63:SET(I,6,C):NEXT
330 FORI=6TO28:SET(0,I,C):NEXT
340 FORI=0TO63STEP4:FORY=6TO10:S
ET(I,Y,C):NEXTY,I
350 FORI=0TO63STEP8:FORY=10TO16:
SET(I,Y,C):NEXTY,I
360 FORI=0TO63STEP16:FORY=16TO20

```

```

:SET(I,Y,C):NEXTY,I
370 FORY=20TO22:SET(32,Y,C):NEXT
380 RETURN
390 L=0:FORI=0TO18STEP4:L=L+2:PO
KE1218+I,47+L:NEXT
400 L=0:FORI=21TO31STEP4:L=L+2:P
OKE1216+I,49:POKE1217+I,47+L:NEX
T
410 FORI=0TO31STEP4:POKE1249+I,4
5:POKE1250+I,45:NEXT
420 FORI=0TO31STEP4:POKE1281+I,4
9:POKE1282+I,54:NEXT:RETURN
430 L=0:FORI=0TO31STEP8:L=L+2:PO
KE1316+I,47+L:NEXT
440 FORI=0TO31STEP8:L=L+2:POKE13
48+I,45:NEXT
450 FORI=0TO31STEP8:POKE1380+I,5
6:NEXT:RETURN
460 POKE1384,49:POKE1400,51:POKE
1416,45:POKE1432,45:POKE1448,52:
POKE1464,52:RETURN
470 POKE1424,49:POKE1456,45:POKE
1488,50
480 RETURN
490 DATA 1/16,1/8,3/16,1/4,5/16,
3/8,7/16,1/2,9/16,5/8,11/16,3/4,
13/16,7/8,15/16
500 GOSUB300:TM=0

```

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1. I/O -Commands					
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DSKOS	FIELD	FILES	GET	INPUT	KILL
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CALL	END	EXEC	FOR	STEP	NEXT
GOSUB	GOTO	IF	THEN	ELSE	ERROR
ON..GO	RETURN	STOP	SUBROUTINE		
3. Math Functions					
ABS	ASC	ATN	COS	CVN	EOF
EXP	FIX	INSTR	INT	LEN	LOG
LOC	LOF	PEEK	POINT	PPOINT	RND
SGN	SIN	SQR	TAN	TIMER	VAL
4. String Functions					
CHR\$	INKEY\$	LEFT\$	MID\$	MKNS	RIGHT\$
STR\$	STRINGS				
5. Graphic/Sound Commands					
COLOR	CLS	CIRCLE	DRAW	LINE	PAINT
PCLEAR	PCLS	PLAY	PMODE	PRESET	PSET
RESET	SCREEN	SET	SOUND		
6. Other/Special Commands					
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```

510 P=RND(15):K=P*4:FORI=0TOK:SE
T(I,4,8):NEXT
520 PRINT@0,"HOW LONG IS THIS LI
NE? ";
530 GOSUB760:IFK$=N$(P)THEN NC=N
C+1:GOTO600
540 PRINT@0,WO$;:IFTM=0THEN560
550 GOSUB390:GOSUB430:GOSUB460:G
OSUB470
560 NW=NW+1
570 TM=TM+1:IFTM>3THEN590
580 PRINT@0,"SORRY, TRY AGAIN: "
;:GOTO530
590 PRINT@0,WO$;:PRINT@0,"SORRY,
IT IS ";N$(P);" INCHES LONG.:G
OTO620
600 PRINT@0,WO$;:PRINT@0,"VERY G
OOD! PLEASE PRESS <ENTER>!";
610 GOSUB390:GOSUB430:GOSUB460:G
OSUB470
620 X$=INKEY$:IFX$=CHR$(13)THEN5
00ELSEIFX$="@ "THEN630ELSE620
630 CLS:PRINT:PRINT:PRINT
640 PRINTTAB(3)"PROBLEMS COMPLET
ED = "NC+NW:PRINT
650 PRINTTAB(3)"CORRECT RESPONSE
S = "NC:PRINT
660 PRINTTAB(3)"INCORRECT RESPON

```

```

SES = "NW:PRINT
670 TR=NC+NW:IFTR=0THENTR=1
680 SC=INT(NC/TR*100)
690 PRINTTAB(3)"YOUR TOTAL SCORE
= "SC"%":PRINT
700 PRINTTAB(3)"ANOTHER TRY (Y/N
) OR (C) ?";
710 X$=INKEY$:IFX$=" "THEN710
720 IFX$="Y"THEN RUN
730 IFX$="N"THEN CLS:END
740 IFX$="C"THEN 500
750 GOTO710
760 PRINT"=> ";
770 Y$=""
780 X$=INKEY$:IFX$=" "THEN780
790 IFX$=CHR$(13)THEN880
800 IFX$=CHR$(8)THEN860
810 IFX$="@ "THEN630
820 IFX$=" "THEN780
830 IF ASC(X$)<13THEN780
840 IF ASC(X$)>64 THEN780
850 Y$=Y$+X$:PRINTX$;:GOTO780
860 WW=LEN(Y$):IFWW=0THEN770
870 PRINTX$;:Y$=LEFT$(Y$,WW-1):G
OTO780
880 PRINT
890 K$=Y$
900 RETURN

```

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# CoCo Synthesizer Produces



**E**ven if you don't know much about music, banging away on the keys of a piano can be a lot of fun. If you have always wanted to compose music, but didn't have an instrument or the time to learn how to play, now you do. The CoCo *Piano-Synthesizer/Composer* makes composing tunes easy. It turns the CoCo's keyboard into a piano keyboard, remembers the notes played and plays them back at any tempo you choose. It provides a powerful editor for correcting or altering the stored music data.

*Martin and Jeremy Spiller are a father and son team from Shirley, Massachusetts. Martin is a dentist and enjoys programming in his spare time. Jeremy is 14 years old and hopes to own his own software company someday.*

The CoCo piano allows you to save each composition on tape or disk, and to load them as stand-alone machine language programs that EXEC without the help of the BASIC language driver. Furthermore, it automatically creates PLAY statements complete with line numbers and stores them on tape or disk for merging into BASIC programs. This function is in addition to, and totally separate from, the ability to store the music as synthesized ML programs. You may reload your ML composition back into the BASIC editor at a later date and add to or edit the composition. Please note that the CoCo piano does not play chords, only single notes.

The CoCo *Piano-Synthesizer/Composer* can be programmed to sound like a wide variety of instruments (as well as non-instruments). It contains two envelope

tables that can be programmed by the user. With a bit of experimentation, it can sound like a jazz piano, an organ, an echo chamber or like no instrument ever heard before. You can toggle from one envelope to the other at any time while composing. This change is recorded in the musical data and, on playback, toggles a change to the other envelope. When the composition is saved, any changes made in the envelope tables are automatically saved along with the music data.

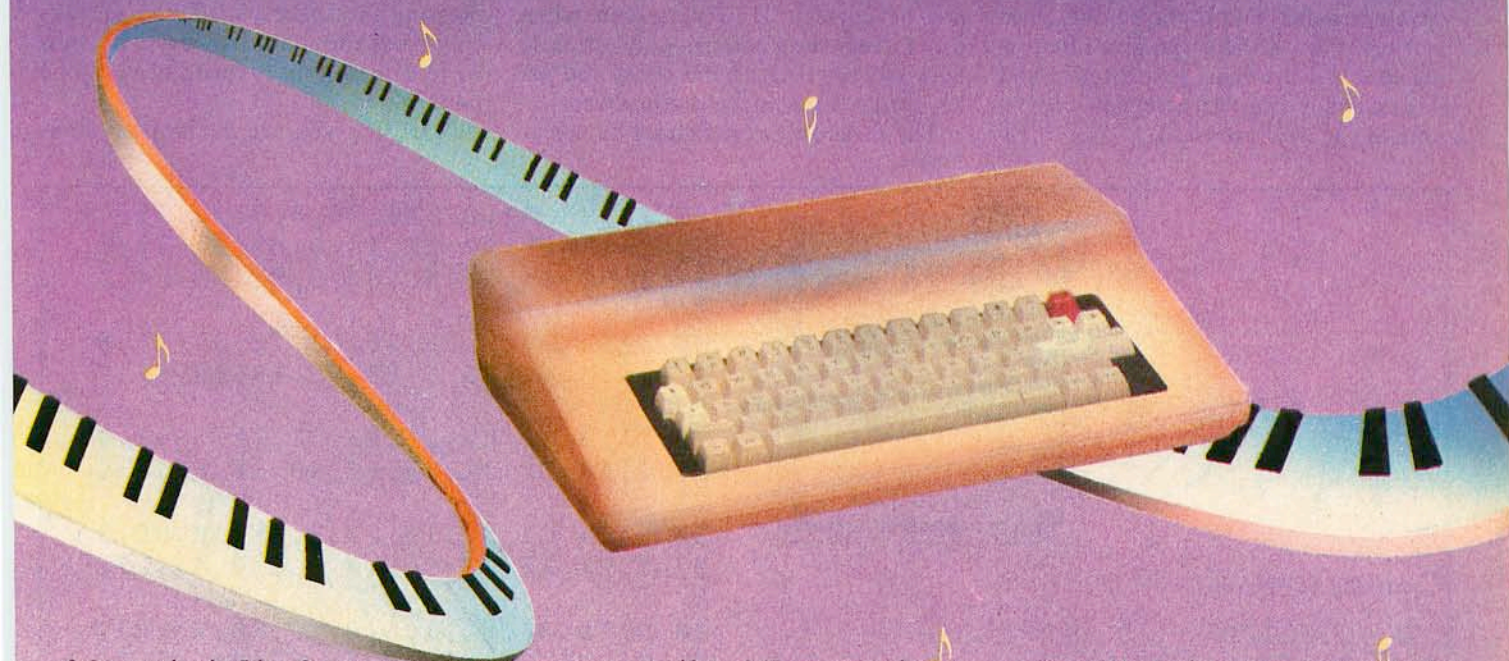
## How to Use the Program

There are two separate program listings. The first one boots the machine language synthesizer into memory and saves it on tape or disk as *PIANO/BIN*. Line 2 of the booter contains checksums for each of the data lines. Provided all



# Out-Of-This-World Sounds

By Martin and Jeremy Spiller



of the entries in Line 2 are correct, the program tells in which line you have made a mistake in typing the rest of the data statements. Do not renumber this program! If you get an error report and can't find the error in the line reported, check to see if the checksum in Line 2 is correct.

The second program listing is the BASIC language utility that allows easy management of the ML program. While keying it in, it is best to include only those spaces between commands that you see in the listing. We economized on memory to allow 16K users to use the piano, and extra spaces use extra memory. Save this program on disk or tape as *PIANO/BAS*. *PIANO/BAS* loads *PIANO/BIN* each time it is run, so both programs should be on the same disk or tape. Run the BASIC program. A

prompt asks if the ML program is to be loaded from tape or disk. Once the ML program has been loaded, the main menu appears.

Now press '1'. This puts you in the play/compose mode. Begin playing music and the computer stores the notes and their lengths. The length of the note depends mostly on the length of time your finger remains on the key. However, the program does record information on the length of time between keystrokes up to a maximum of one second.

In this mode, a text screen representation of the keyboard appears on the TV. The keyboard looks like a two-tiered organ keyboard. All of the keys in the second row and most of the keys in the bottom row are mapped to resemble the white keys on a piano. They are

each marked with the note that the key plays when depressed. The keys above them represent the black keys on the piano. Notice that some of the keys in the first and third rows are colored blue on the map. These keys produce no sound when pressed, and are not recorded in music memory. They represent sharps and flats that do not exist on the chromatic scale; their omission gives the keyboard the appearance of a piano keyboard.

Three octaves are represented, starting at middle C. They go from the up-arrow key to the 'Y' key, from the 'U' key to the right-arrow key, and from the 'Z' key to the '<' key.

Some of the keys are colored red — these are control keys. They are the CLEAR, ENTER, SHIFT, '?' and space bar. These can be pressed at any time while



in the play/compose mode. The SHIFT key exits the synthesizer and returns to the main menu.

In order to simplify playing the keyboard, consider using black-and-white self-adhesive tabs to cover the appropriate keys. These can be obtained at any stationery store. If you can't find these, try small pieces of colored electrician's tape.

### Playing versus Composing

The machine code program was originally formulated to allow experimentation. The object was to allow the user to modify a pure tone by manipulating its volume over time. This is done by specifying the volume at discrete intervals in what is known as an envelope pattern. Some envelope patterns, such as the piano envelope, sound lovely if stretched out over a long period (a high envelope delay) and if played only once per key press. Others can give interesting effects if the delay is shortened and if the envelope pattern is repeated for as long as the key is pressed.

As the program evolved, however, the keyboard developed into a piano and we decided to store the notes and their lengths in memory. We discovered that when repeating patterns were used, memory filled up too fast. For this reason, we decided to allow composing

tion for composing. We have chosen an arbitrary envelope delay (representing tempo) of 1100, and a non-repeating piano envelope as default. Whenever a note key is pressed in the play/compose mode, note and length data is stored in memory whether you want to keep the

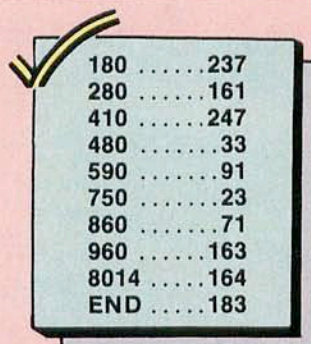
*"It can sound like a jazz piano, an organ, an echo chamber . . ."*

only in the non-repeating mode. While you get meaningful note data in the repeating mode, the length data may not be correct. However, even when using a repeating pattern, only one note byte and two length bytes are stored per key strike, so memory is conserved.

The program is configured at execu-

tion for composing. You will store meaningful length data as long as you do not switch to a repeating envelope pattern by pressing the space bar. If you mistakenly press the space bar, press it again to return to a non-repeating envelope pattern.

Now that you are in the play/com-



180	.....	237
280	.....	161
410	.....	247
480	.....	33
590	.....	91
750	.....	23
860	.....	71
960	.....	163
8014	.....	164
END	.....	183

Listing 1: PIANOBIN

```

0 GOTO1000
1 CLEAR200,&H2FFF
2 DATA 1847,2952,2629,2549,2518,
1653,1806,1698,1525,2938,1478,17
37,1948,2446,2333,1796,1916,1631
,1711,1186,867,1187,1180,1006,16
98,879,1382,1025,1322,1544,1951,
2067,2059,1813,1907,2319,2268,16
09,1754,2414,1878,2275,637
4 DIM SUM(43):FOR Z=1 TO 43:READ
SUM(Z):NEXT Z
10 DATA 8D,11,7F,31,78,8E,32,19,
BF,31,76,30,88,1F,BF,31,7A,20,1B
,B6
20 DATA FF,1,84,F7,B7,FF,1,B6,FF
,3,84,F7,B7,FF,3,B6,FF,23,8A,8
30 DATA B7,FF,23,1A,50,39,1C,FE,
BE,31,76,BF,31,73,FE,31,7C,86,FF
,B7
40 DATA FF,2,C6,FF,5C,79,FF,2,B6

```

```

,FF,0,8A,80,81,FF,26,6,C1,7,26
50 DATA EF,20,DB,34,4,B7,31,75,C
6,FF,5C,46,25,FC,86,8,3D,EB,E4,3
5
60 DATA 2,C1,2F,26,23,7C,31,78,B
6,31,78,44,25,E,8E,32,19,BF,31,7
6
70 DATA 30,88,1F,BF,31,7A,20,C,8
E,32,3A,BF,31,76,30,88,1F,BF,31,
7A
80 DATA C1,37,10,27,2,1E,10,8E,3
0,A2,E1,A0,27,94,10,8C,30,AA,27,
A
90 DATA 20,F4,1,6,B,1C,20,23,27,
37,C1,1F,26,31,7C,31,79,B6,FF,0
100 DATA 8A,80,81,FF,26,F7,16,FF
,71,B6,FF,0,8A,80,81,FF,26,F7,BE
,33
110 DATA D,86,20,A7,1,17,2,3F,E7
,2,30,3,BF,33,D,BC,31,7E,24,69
120 DATA 16,FF,4F,C1,31,26,F,BE,
33,D,30,1D,8C,33,4C,25,C4,BF,33,
D
130 DATA 20,BF,8E,31,80,86,3,3D,
3A,A6,2,A7,9F,33,D,EC,84,34,6,A6
140 DATA 9F,31,73,84,FC,E6,E4,8D
,7,4F,E6,61,8D,2,20,EF,5A,26,2F,
8A
150 DATA 2,B7,FF,20,B6,FF,0,8A,8
0,B1,31,75,27,1F,32,64,FC,31,73,
B3
160 DATA 31,76,BE,33,D,E7,1,17,1
,D9,E7,2,30,3,BF,33,D,BC,31,7E

```



pose mode, go ahead and try playing some music. For 16K users, about 1,000 notes can be stored before running out of room; 32K users should be able to bang away for most of the day before hitting the top of RAM. If this happens, don't worry. The binary program checks to see if the limit has been reached and returns to the menu. Nothing has been lost, and you can still play back, alter and save the stored data.

Each time a note key is pressed, the CoCo remembers the note and the length of time your finger was on the key. It also keeps track of the time between keystrokes up to a second. If you are inexperienced and spend a lot of time looking for the next key to press, the program takes no notice beyond one second. For experienced piano players, the only problem is getting used to the keyboard itself. Remember that if you press a second key while the first is still pressed, there will be no response until you take your finger off the first key.

## The Control Keys

Correction of mistakes in the play/compose mode is limited to the CLEAR key. Whenever this key is pressed, the last note played is eliminated. Pressing it twice or three times eliminates the last two or three notes played. The entire composition can be eliminated this way. Any notes eliminated are replaced with the next note keys pressed.

When you are finished composing and want to return to the main menu, simply press either SHIFT key. If you mistakenly exit the play mode, return to the same position in the composition by pressing '2' at the menu. Beware. If the '1' is pressed, the program assumes you want to compose a new piece and dumps any music already in memory.

The computer keeps track of pauses that last up to one second. This creates a problem with longer or multiple pauses that normally occur in musical notation. The ENTER key makes it possible to place pauses in the music. It

works the same way the note keys work. The pause lasts for as long as you press the ENTER key. During composition, this creates a high pitched noise that indicates something is being pressed. This noise does not occur on playback.

Of course, if you are only fooling around with the synthesizer and do not care about what is stored in memory, you do not need the pause button at all. You will, however, want to use the space bar. This control toggles between repeating envelopes and single envelope strikes. Remember that repeating envelopes do not give meaningful note length data and should be avoided when composing.

The final control key is the question mark key. The synthesizer program contains two programmable envelope tables. The question mark key toggles between the two tables and allows playing of different parts of a composition with different sounding envelopes. Any time this control key is

```
170 DATA 24,3,16,FE,E9,39,33,5F,
11,83,0,0,26,C6,FE,31,7C,BE,31,7
3
180 DATA 30,1,BC,31,7A,27,5,BF,3
1,73,20,B4,B6,31,79,44,25,5,32,6
4
190 DATA 16,FF,52,BE,31,76,BF,31
,73,20,A1,32,19,BF,32,19,0,0,32,
38
200 DATA 4,4C,7F,FF,3F,3F,14,1,1
,80,1F,1F,20,25,25,1D,27,28,1C,9
0
210 DATA 90,6,1,1,80,20,21,1F,1D
,1E,21,53,53,F,1A,1B,23,1,1,80
220 DATA 15,16,26,19,19,24,1C,1C
,22,4B,4B,11,47,47,12,AC,AC,3,80
,80
230 DATA 8,2D,2D,1A,71,71,A,5E,5
E,D,22,22,1E,98,98,5,2A,2A,1B,65
240 DATA 65,C,30,2F,19,C1,C1,1,1
,1,80,37,39,16,31,31,18,0,0,0
250 DATA 1,1,80,B6,B7,2,A2,A2,4,
1,1,80,88,88,7,78,79,9,6B,6B
260 DATA B,1,1,80,58,59,E,4F,4F,
10,43,43,13,13,13,28,17,17,25,3B
270 DATA 3B,15,14,14,27,1,1,64,5
,5,FF,1,1,64,34,34,17,FF,CA,AA
280 DATA 91,7E,6B,5B,50,46,3D,35
,2D,28,22,1D,1A,17,15,12,10,F,D,
C
290 DATA A,9,8,7,6,5,4,3,2,1,FF,
89,44,4,E6,95,41,4,D2,91
300 DATA 41,4,C0,79,41,4,AD,70,3
4,4,9A,63,2C,4,86,54,29,4,74,48
```

```
310 DATA 22,0,17,FD,B6,7F,31,78,
10,8E,33,4C,8E,32,19,BF,31,76,FE
,31
320 DATA 7C,BE,31,76,BF,31,73,10
,BC,33,D,27,37,E6,21,BE,31,76,3A
,BF
330 DATA 32,B1,E6,A4,8E,31,80,C1
,64,26,1D,7C,31,78,B6,31,78,44,2
5,A
340 DATA 8E,32,19,BF,31,76,31,23
,20,CC,8E,32,3A,BF,31,76,31,23,2
0,C2
350 DATA E1,2,27,7,30,3,20,F8,39
,32,33,EC,84,34,6,A6,9F,31,73,E6
360 DATA A4,C1,FF,26,1,4F,E6,E4,
8D,7,4F,E6,61,8D,2,20,EA,5A,26,2
8
370 DATA 8A,2,B7,FF,20,BE,31,73,
BC,32,B1,10,23,FE,66,8D,55,CE,0,
32
380 DATA 33,5F,11,83,0,0,26,F8,3
0,1,BF,31,73,32,64,31,23,16,FF,7
2
390 DATA 33,5F,11,83,0,0,26,CD,F
E,31,7C,BE,31,73,30,1,BF,31,73,2
0
400 DATA C0,33,4C,C6,1,7F,FF,2,B
6,FF,0,8A,80,81,FF,10,26,FE,26,4
F
410 DATA 10,21,FD,A,10,21,FD,6,4
C,27,2,20,F3,5C,C1,FF,10,27,FE,1
1
420 DATA 20,DE,5F,4F,10,21,FC,F2
,10,21,FC,EE,4C,26,F5,5C,E1,22,1
```



pressed, a code is stored in the music memory that triggers a corresponding shift during playback.

### Envelope Delay and Play Delay

How long is a whole note? The longest note stored in memory is a whole note and is proportional to the envelope delay. Press a note key in the default mode and listen carefully. The sound trails off to nothing. The length of time it takes for the sound to fade away totally is the longest note length stored in memory. Keeping your finger on a key longer does not lengthen the time between that note and the next during playback.

If you are playing a very slow tempo piece and need a longer whole note,

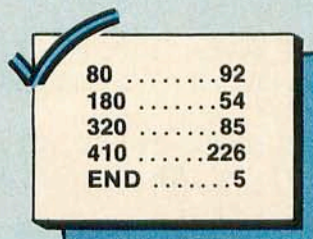
simply increase the envelope delay. If you are playing a very fast piece and want to hear more of a fadeoff during short keystrokes, shorten the envelope delay. It is best to alter the envelope delay before storing data to keep. A short keystroke with a long envelope delay causes the program to store only a part of the entire envelope. Increasing the envelope delay after the data has been stored lengthens the note, but it does not increase the proportion of the envelope played. The envelope delay may be altered from the main menu by pressing the "change tempo" option. Numbers between one and 65,535 will work. Try the default envelopes using an envelope delay of 500.

The play delay can also be altered

from the main menu by pressing "change tempo." While the envelope delay has an effect in both the play and playback modes, the play delay operates only in the playback mode. It accounts for a constant pause between notes when they are played back. It is included as a fine adjustment for playback timing. The default value is 50.

This is the first parameter to alter if the playback is too fast or too slow. Values between one and 65,535 are accepted. Small increases or decreases don't make much difference, so don't be afraid to change it by factors of 1,000. You may later alter the play delay or the envelope delay at any time, even after composing a piece. They do not affect the stored music data once it has been

```
0,27
430 DATA FF,66,20,EB,D
435 Z=0:SUM=0:L=10
440 FOR X=&H3000 TO &H334C:READA
$:A$="&H"+A$:A=VAL(A$):POKE X,A:S
UM=SUM+A:Z=Z+1:IF Z=20 OR X=&H334
C THEN 450 ELSE NEXT X
450 PRINT"WORKING ON LINE #";L:
IF SUM<>SUM(L/10) THEN CLS3:PRIN
T@257,"ERROR IN LINE #";L:END
460 SUM=0:L=L+10:Z=0:IF X=&H334C
THEN 470 ELSE NEXT X
470 CLS:PRINT"ENTER SYSTEM SIZE
(16 OR 32)":INPUT A
480 IF A=16 THEN POKE&H317E,&H3F
:POKE&H317F,&H80:GOTO 510
490 IF A=32 THEN POKE&H317E,&H7F
:POKE&H317F,&H80:GOTO 510
500 GOTO 470
510 CLS:INPUT"(C)A SETTE OR (D)IS
K";D$:IF D$="D"THEN SAVEM"PIANO"
,&H3000,&H334C,&H325A:END
520 CSAVEM"PIANO",&H3000,&H334C,
&H325A
1000 PCLEAR1:GOTO1
```



80	.....92
180	.....54
320	.....85
410	.....226
END	.....5

Listing 2: PIANOBAS

```
5 GOTO20000
10 CLS:PRINT"PLEASE REMOVE JOYST
ICK FROM RIGHT JOYSTICK PORT
":PRINT
14 CLEAR255,&H2FFF
```

```
20 INPUT"(C)A SETTE OR (D)ISK";D$
:IF D$="C"THENCLOADM"PIANO"ELSEL
OADM"PIANO"
40 DIMN$(12)
50 CLS:PRINT@14,"MENU":PRINT
60 PRINT" 1) COMPOSE MUSIC"
70 PRINT" 2) ADD ON TO MUSIC"
80 PRINT" 3) PLAY MUSIC"
90 PRINT" 4) SAVE MUSIC"
100 PRINT" 5) LOAD MUSIC"
110 PRINT" 6) CHANGE ENVELOPE"
120 PRINT" 7) CHANGE TEMPO"
130 PRINT" 8) ASSEMBLE TO PLAY
COMMANDS"
140 PRINT" 9) EDIT YOUR COMPOSI
TION"
150 PRINT@480," ";A$=INKEY$:IFA
$=""THEN150
160 B$=INKEY$:FORX=&H152 TO&H152
+7:IFPEEK(X)=255THENNEXT:GOTO170
ELSE160
170 ONVAL(A$)GOTO300,310,320,330
,340,360,440,8000,500
180 GOTO500
190 CLS:A$="c d z f g a z c d z
f g a":B$="C D E F G A B C D E F
G A B":FORX=1TOLEN(A$):C$=MID$(
A$,X,1):IF C$="z"THENMID$(A$,X,1
)=CHR$(175)
200 IFC$=" "THENMID$(A$,X,1)=CHR
$(128)
210 NEXT:FORX=1 TOLEN(B$):C$=MID
$(B$,X,1):IFC$=" "THENMID$(B$,X,
1)=CHR$(138)
220 NEXT:CLS0
230 PRINT@4,A$;:PRINT@67,B$;:A$=
CHR$(175)+CHR$(170)+CHR$(175)+CH
R$(170)+A$:A$=LEFT$(A$,22):A$=A$
+STRING$(4,255)+CHR$(128)+CHR$(2
55):PRINT@132,A$;:B$=STRING$(3,2
55)+CHR$(133)+B$:B$=LEFT$(B$,21)
```



placed in memory, but they affect the playback of that data.

### Programming the Envelope Tables

Before programming an envelope, you must know something about synthesizing periodic sounds. The CoCo has no sound-generating circuitry. In order to produce sounds, the microprocessor must minutely manipulate the voltage output to the loudspeaker. (That it can do this quickly enough to produce a fantastic array of sounds is a testament to the extreme versatility of the 6809 and the Color Computer.)

In order to produce the sound of a particular instrument, most hardware synthesizers produce a particular sine wave electrical output varying between

zero and five volts. This pure tone is then modified to produce the same general pattern of electrical output as the sound output of the instrument it is trying to mimic. The unmodified sine wave produces a pure tone of a particular volume depending upon the maximum voltage allowed by the circuitry. The envelope modifications are mainly constraints on the volume of the sine wave over time.

To produce the sound of a piano, it begins with a maximum volume when the key is struck, falling off rather quickly at first and then more slowly until it fades out entirely. This is exactly what the CoCo *Piano-Synthesizer* does: It produces a square wave instead of a true sine wave, the maximum voltage of

which is controlled by the values in the envelope table.

Go back to the main menu and press '6'. When the prompt asks which table to use, press '1' and ENTER. Now remember what we said about the fast falloff and a gentle fadeout? The graph shown is the envelope used to produce the piano default sound. This envelope can be altered or a totally new one created by using the left joystick and firebutton. For example, position the cursor at the bottom left side of the screen and press the firebutton. The original point disappears and is replaced by the new one. Now move the cursor one position to the right and four above the one just set and press the firebutton again. Continue this process,

```
:B$=B$+CHR$(128)+CHR$(255)+CHR$(
128)+STRING$(3,255)
240 FOR X=1 TO LEN(B$):IF MID$(B$,X
,1)=CHR$(138) THEN MID$(B$,X,1)=CH
R$(133):NEXT ELSE NEXT
250 PRINT@196,B$;:PRINT@267,STRIN
G$(11,255);
260 PRINT@384,"ENTER = PAUSE : ?
= NEW ENVELOP"
270 PRINT"SHIFT = MENU : CLEAR=
BACKSPACE"
280 PRINT"      SPACEBAR=REPEAT T
OGGLE
290 RETURN
300 GOSUB190:POKE&H330D,&H33:POK
E&H330E,&H4C:EXEC&H3000:GOTO50
310 GOSUB190:EXEC&H3000:GOTO50
320 GOSUB190:EXEC&H325A:GOTO50
330 CLS:S=&H3000:E=PEEK(&H330D)*
256+PEEK(&H330E):PRINT"SAVE":INP
UT"ENTER SONG NAME";F$:INPUT"(C)
ASETTE OR (D)ISK";D$:IF D$="D" T
HEN SAVEM F$,S,E,&H325A:GOTO50
335 CSAVEMF$,S,E,&H325A:GOTO50
340 CLS:PRINT"LOAD:":INPUT"ENTER
SONG NAME: ";F$:INPUT"(C)ASETTE
OR (D)ISK";D$:IF D$="C" THEN CLOADM
F$ ELSELOADMF$
345 GOTO50
350 IFC=0 THEN RESET(A,B):RETURNEL
SESET(A,B,3):RETURN
360 CLS:INPUT"WHICH ENVELOPE DO
YOU WANT TO      CHANGE (1 OR 2)";
E
370 IFE=0 THEN E=1
380 IFE=1 THEN E=&H3219 ELSE E=&H32
3A
390 CLS
400 FOR X=0 TO 63 STEP 2:A=PEEK(E):SE
T(X,31-INT(PEEK(E)/8),3):E=E+1:N
EXT:E=E-32
```

```
410 Z=JOYSTK(0):A$=INKEY$:IFA$<>
"" THEN 50 ELSE A=JOYSTK(2):A=INT(A/
2):A=A*2:B=JOYSTK(3):B=INT(B/2):
C=POINT(A,B):SET(A,B,3):FOR X=1 TO
20:NEXT:GOSUB350:IF PEEK(&HFF00)=
253 THEN 430
420 GOTO410
430 POKEE+A/2,255-(B*8):FOR Y=0 T
O 31:RESET(A,Y):NEXT:SET(A,B,3):G
OTO410
440 PLYDLY=PEEK(&H32E2)*256+PEEK
(&H32E3):ENV DLY=PEEK(&H317C)*256
+PEEK(&H317D)
450 CLS:PRINT"CURRENT PLAYDELAY=
";PLYDLY:PRINT"HIGHER OR LOWER V
ALUES WILL      LENGTHEN OR SHORT
EN PAUSES BE-   TWEEN NOTES ON PL
AYBACK ONLY.    ENTER NEW VALUE,
OR <ENTER>      TO LEAVE THE SAME
"
460 INPUT A:IFA$<>0 THEN B=INT(A/256
):C=A-256*B:POKE&H32E2,B:POKE&H3
2E3,C
470 CLS:PRINT"CURRENT ENVELOPE D
ELAY=";ENV DLY:PRINT"LOWER VALUES
WILL COMPRESS THE ENVELOPE INT
O A SHORTER TIME AND INCREASE
THE TEMPO OF BOTH COMPOSITION
AND PLAYBACK. ENTER NEW VALUE OR
<ENTER> TO LEAVE THE SAME"
480 INPUT A:IFA$<>0 THEN B=INT(A/256
):C=A-256*B:POKE&H317C,B:POKE&H3
17D,C
490 GOTO50
500 CLS:S=&H334C:P=0:FS=0:CP=0:M
=256+PEEK(&H330D)+PEEK(&H330E):L
P=(M-S)/3:GOSUB510:GOTO520
510 N$(1)="C":N$(2)="C#":N$(3)="
D":N$(4)="D#":N$(5)="E":N$(6)="F
":N$(7)="F#":N$(8)="G":N$(9)="G#
":N$(10)="A":N$(11)="A#":N$(12)=
```



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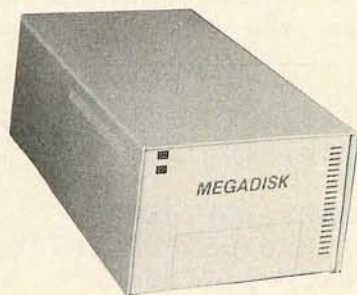


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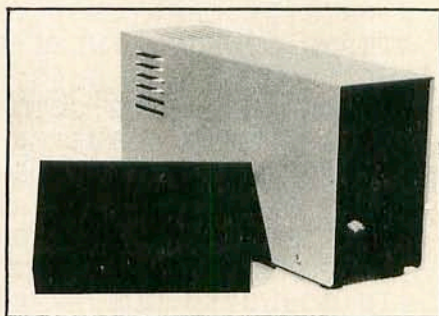
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depositing points three or four higher in each succeeding position, until it reaches the top of the screen. Then, for the next cursor position, move the cursor to the bottom of the screen and repeat the same process.

Do this until you reach the last cursor position on the right. You have created

effect. When you are finished creating the envelope, press any key to return to the menu.

Now try playing any selection still in memory. If there is no stored data, just play something from the compose mode. Try changing the tempo. Type in an envelope delay of 100. Press '1' at the

you can type in literally any envelope pattern wanted, the best ones follow a pattern. Each succeeding value should bear a rational relationship to its neighbors rather than being a random scattering of points. Maybe the points follow some sort of curve, or a pair of curves. Maybe every third point is offset from the curve by some fixed amount. The possibilities are endless, and when combined with various envelope delays and repeating patterns, quite a collection of different sounds can be created. Both envelope tables are programmable. An organ-like effect can be produced by using an envelope that is a straight horizontal line at the top of the screen.

For those interested in experimenting with sound, try a rational envelope

## *"Each note is represented in memory as three data bytes."*

a series of upward sloping lines. To be really fancy, make the top of each succeeding line several positions lower than the last one to create a trail-off

menu and get into play mode. Play a few notes and then press the space bar. Now play the same notes over. Interesting!

A word about coherent values. While

```
"B":RETURN
520 FORX=0 TO448STEP32
530 IFP=LP THENFORZ=X TO448STEP3
2:PRINTSTRING$(16,CHR$(175)):NEX
TZ:GOTO620
540 N=PEEK(S+3*P):IFN=255THENN$=
"PAU":PRINT@X,P:PRINT@X+5,N$:GOT
O570
550 IFN=100THENN$="env":L1=0:L2=
0:GOTO580
555 GOSUB560:GOTO570
560 O$=RIGHT$(STR$(INT((N-1)/12)
+2),1):Z=N-12*INT((N-1)/12):N$=N
$(Z):N$=O$+N$:RETURN
570 L1=PEEK(S+3*P+1):L2=PEEK(S+3
*P+2)
580 PRINT@X,P:PRINT@X+5,N$:IFN=1
00THEN600
590 PRINT@X+10,RIGHT$(STR$(L1),2
):L2
600 P=P+1
610 NEXT X
620 'EDIT MENU
630 PRINT@17,"1.PLAY SEGMENT":PR
INT@51,"TO CURSOR":PRINT@81,"2.P
LAY START":PRINT@115,"TO CURSOR"
:PRINT@145,"3.PLAY CURSOR":PRINT
@179,"TO END":PRINT@209,"4.NEW S
EGMENT":PRINT@241,"5.CHANGE NOTE
":PRINT@273,"6.INSERT NOTE":PRIN
T@305,"7.DELETE NOTE"
640 PRINT@337,"8.MAIN MENU":PRIN
T@369,"9.QUICK CHANGE":PRINT@403
,"TEMPO BYTES"
650 X=4:P=FS:CP=0
660 PRINT@X,CHR$(128);
670 A$=INKEY$:IFA$=""THEN670
680 IFA$=CHR$(94)OR A$=CHR$(10)T
HEN720
690 IFVAL(A$)<1OR VAL(A$)>9 THEN
```

```
670
700 ONVAL(A$)GOTO790,800,810,820
,845,948,980,710,1000
710 GOTO50
720 IFA$=CHR$(10)THEN740
730 IFX=4THEN670ELSEPRINT@X," ";
:X=X-32:CP=CP-1:GOTO660
740 IFX=452OR FS+CP+1=LP THEN670
ELSEPRINT@X," ";:X=X+32:CP=CP+1:
GOTO660
750 M1=PEEK(&H330D):M2=PEEK(&H33
0E):RETURN
760 A1=INT((S+3*FS)/256):A2=(S+3
*FS)-A1*256:RETURN
770 A1=INT((S+3*FS+3*(CP+1))/256
):A2=(S+3*FS+3*(CP+1))-A1*256:RE
TURN
780 EXEC&H325A:FORZ=1 TO300:NEXT
Z:PRINT@X,CHR$(255);:FORZ=1TO255
STEP20:SOUNDZ,1:NEXT:POKE&H3262,
&H33:POKE&H3263,&H4C:POKE&H330D,
M1:POKE&H330E,M2:GOTO660
790 GOSUB750:GOSUB760:POKE&H3262
,A1:POKE&H3263,A2:GOSUB770:POKE&
H330D,A1:POKE&H330E,A2:GOTO780
800 GOSUB750:GOSUB770:POKE&H330D
,A1:POKE&H330E,A2:GOTO780
810 GOSUB750:GOSUB770:Z=256*A1+A
2:Z=Z-3:A1=INT(Z/256):A2=Z-A1*25
6:POKE&H3262,A1:POKE&H3263,A2:GO
TO 780
820 CLS:PRINT"PLEASE TYPE POSITI
ON NUMBER FOR NEW SEGMENT":INPUT
Q
840 FS=Q:P=Q:GOTO520
845 GOSUB850:GOTO520
850 FOR Z=16TO464STEP32:PRINT@Z,
STRING$(15," "):NEXTZ:Z=S+3*FS+3
*CP:PRINT@17,"ENTER NEW NOTE":PR
INT@49,"ENTER TO EXIT":PRINT@81,
```



using very short delays (say 50) and a repeating pattern. Note that different keys vary in tonal quality as well as in pitch. The reason for this involves the interference patterns produced as the envelope delay gets nearer to the frequency delay (the delay used to produce the desired pitch). You may hear different "beat frequencies" with different keys.

### Saving and Loading Compositions

Once you have composed and perfected the music, *PIANO/BAS* provides the means to save it on disk or tape. This is done from the menu and is self-prompting. It is saved with any altered envelope tables, envelope delay and play delay that are *POKE*d in while composing, so each composition has its own unique sound. You do not have to run the BASIC driver in order to play the music. Just *LOADM* or *CLOADM* whatever filename is used to store it. Then type *EXEC* and the piece plays.

If it needs further editing, run the BASIC driver and load the previously stored piece from the menu. Add to it, change the envelopes, the delays, or alter the note data and then resave the changes.

### The Editor

We have done our best to confine the BASIC program in order to allow 16K owners to use the piano. The editor is simple, but adequate for manipulation of program data. It windows any 15-note segment of your composition, and allows replaying any part of that segment from the beginning to the cursor position.

Play something from the compose mode and press '9' at the main menu. The first column on the left is the note position. It starts at zero and increments for each note in the composition. The other columns represent actual note data. Each note is represented in memory as three data bytes. The second

editor column translates the first data byte into an octave and a note. The third column contains the note length. These numbers go from one to 32; 32 is the longest note played. (If most of these numbers are less than 15, you might consider resetting the envelope delay to a smaller number and replaying the piece. That way, more of the envelope is heard during each keystroke.)

The last column is the pause interval that keeps track of the time between keystrokes. It is a number between one and 255. The higher the number, the longer the pause. This pause is not to be confused with the pauses intentionally placed in the data by pressing the *ENTER* key. Those pauses are stored just like any other note, with a note length and an interval pause.

The cursor can be moved up or down by pressing the appropriate arrow keys. Notes may be changed, inserted or deleted by positioning the cursor at the note position to be changed or deleted.

```

";:INPUTN$
860 IFN$=""THENP=FS:RETURN
865 IF N$="ENV"THENPOKEZ,100:POK
EZ+1,0:POKEZ+2,0:RETURN
875 IF N$="PAU"THENPOKEZ,255:GOT
O930
890 PRINT@113,"OCTAVE?":PRINT@14
5,"";:INPUTO:IFO<2ORO>4THEN890EL
SEFORX=1 TO12:IFN$<>N$(X) THENNEX
TELSEN=(O-2)*12+X:POKEZ,N:GOTO93
0
892 IF N$="PAU"THENPOKEZ,255:GOT
O930
894 IF N$="ENV"THENPOKEZ,100:GOT
O930
900 GOTO845
930 PRINT@177,"NOTE LEN(1-32)":P
RINT@209,"";:INPUTN:IF N>32OR N<
1 THEN 930
935 POKEZ+1,N
940 PRINT@241,"PAUSE? (1-255)":P
RINT@273,"";:INPUTN:IFN<1ORN>255
THEN940
945 POKEZ+2,N:P=FS
947 RETURN
948 M=M+3:GOSUB950:GOTO960
950 PRINT@433,"thinking":M1=INT(
M/256):M2=M-M1*256:POKE&H330D,M1
:POKE&H330E,M2:RETURN
960 FOR Z=M TOS+3*FS+3*CP+1STEP-
1:A=PEEK(Z-1):POKEZ+2,A:NEXT
970 GOSUB850:LP=(M-S)/3:GOTO520
980 M=M-3:GOSUB950:FORZ=S+3*FS+3
*CP TOM+2:A=PEEK(Z+3):POKEZ,A:NE
XT:LP=(M-S)/3:GOTO520

```

```

1000 :CLS:PRINT"THIS OPTION CHAN
GES ALL NOTE LENGHTS AND/OR P
AUASE BYTES FROM BEGINING OF
SEGMENT TO THE CURSOR":PRINT:PR

```



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Insertions occur at the cursor position, and the remainder of the composition is moved one position higher in memory. Inserting and deleting may take some time in long compositions since the entire data array above the cursor position must be relocated, and this relocation is done from BASIC.

Insert intentional pauses by typing PAU in place of a note. Pauses are like any note in that you must specify a note length and pause length. An envelope table switch may be inserted by typing ENV.

For the inexperienced piano players, we have included an option that allows the user to change both the note lengths and interval pauses en masse. Pressing '9' while in the editor allows you to specify numbers that are automatically inserted into all note positions from the top of the screen to the cursor position. Since any note position can be specified as the first note in each segment (the top of the screen), you can make large-scale changes in tempo or timing with reasonable precision.

#### Assembling PLAY Statements

Pressing '8' at the main menu causes the computer to build BASIC PLAY statements. These are assembled directly to disk or tape as a BASIC program

complete with line numbers. Load them and type RUN to hear them. Those with disk drives can merge them into their own programs after adjusting the line numbers using Extended BASIC's RENUM function.

Line 5 is a tempo line. This line may be altered to speed up or slow down the playback. Since these are run from BASIC without the help of the ML synthesizer, envelope changes are ignored. (Actually, there is a way to get a "pseudo envelope" in BASIC. Those interested should contact Jeremy Spiller for information on how to obtain the program for this.) The PLAY statements offer another method of editing compositions as they can be manipulated using Extended BASIC's editing functions.

#### Tuning Your Piano

While we feel reasonably competent to write computer programs, neither of us play the piano, nor do we even know much about music. We tuned the piano by ear and if you can do better, give it a shot. The key table is located at &H3180. The assembly listing shows it from lines 16100 to 31300.

Look carefully at the assembly listing. Each key is represented by three bytes. The name of the key is com-

mented to the right of its first byte. (Don't confuse these with the three data bytes stored in memory while composing. These begin at &H334C.) The first two bytes are the frequency delays and these account for the pitch of the key. The third byte is the note "name" and is the value stored in the first of the three data bytes while you are composing. The higher the frequency delay values, the lower the sound produced by that key. Note that in most cases, both delay values are the same. Keeping them equal or close to equal keeps the wave square.

The wave shape could be altered toward triangular by drastically reducing one while increasing the other. The wave doesn't have to be square. The delay values can be from one to 255. To sharpen the sound of a key, locate that key in the comment column of the key table and reduce the numbers in the frequency bytes. (The actual memory address is the hexadecimal number in the column farthest to the left in the assembly source code listing. As an example, to sharpen the sound produced by the BREAK key, POKE numbers lower than 52 into addresses &H3216 and/or &H3217.)

To lower the entire keyboard an octave, POKE higher numbers into the

```
INT"ENTER NOTE LENGTH (1-32)
<ENTER> TO LEAVE UNCHANGED"
:INPUTA:IFA=0THEN1030ELSEIFA<1OR
A>32THEN1000
1010 FORZ=S+3*FS TOS+3*FS+3*CP S
TEP3:POKEZ+1,A:NEXT
1030 PRINT:PRINT"ENTER NOTE PAUS
E <ENTER> TO ESCAPE":INPUTA:
IF A=0THEN520ELSEIFA<1OR A>255TH
EN1030
1040 FORZ=S+3*FS TOS+3*FS+3*CP S
TEP3:POKEZ+2,A:NEXT:GOTO520
8000 'PLAY STATEMENTS
8002 L=0:I=0:A=&H334C:E=PEEK(&H3
30D)*256+PEEK(&H330E):GOSUB510
8010 D=1:CLS:PRINT"PREPARE TAPE
RECORDER OR DISK TO RECEIVE PL
AY STATEMENTS":PRINT:INPUT"FILEN
AME";F$:INPUT"(C)ASSETTE OR (D)I
SK";D$:IFD$="C"THENOPEN"O",#-1,F
$:D=-1:GOTO8012
8011 F$=F$+"/BAS":OPEN"O",#1,F$
8012 B$="5 PLAY"+CHR$(34)+"T6"+C
HR$(34):PRINT#D,B$
8014 L=L+1:L$=STR$(L):L$=RIGHT$
(L$,LEN(L$)-1):A$=L$+" PLAY"+CHR
$(34)
8020 FORX=A TOA+27STEP3:IFX=E TH
```

```
EN8100
8030 N=PEEK(X):IFN=255THEN8040EL
SEIFN=100THEN8160ELSEGOSUB560:N$
="O"+N$:IFRIGHT$(N$,1)="#"THENN$
=LEFT$(N$,LEN(N$)-1):N$=N$+"+"
8040 L1=PEEK(X+1):L2=PEEK(X+2):I
FL1=0THENL1=1:IFL2=0THENL2=1
8050 IF L1>16ANDL1<20THENL1=16EL
SE IF L1>19ANDL1<28THENL1=3:GOTO
8060
8055 L1=INT(1/(L1/32))
8060 IF L2>128ANDL2<160 THEN L2=
127 ELSEIFL2>127ANDL2<224 THEN L
2=3:GOTO8070
8065 L2=INT(1/(L2/255))
8070 L1$=STR$(L1):L2$=STR$(L2):L
1$=RIGHT$(L1$,LEN(L1$)-1):L2$=RI
GHT$(L2$,LEN(L2$)-1)
8075 IF N=255THEN8180
8080 N$="L"+L1$+N$+"P"+L2$
8090 A$=A$+N$:NEXTX
8100 A$=A$+CHR$(34):PRINT#D,A$:P
RINTA$
8114 IFX>=E THENCLOSE#D:GOTO50
8120 A=A+30:GOTO8014
8160 IFX=E THEN50ELSENEXTX
8180 N$="P"+L1$+"P"+L2$:GOTO8090
20000 PCLEAR1:GOTO10
```



frequency bytes of all the keys in the table. Do this by trial and error, sharpening or flattening each position until it sounds right. Once you get the table the way you want it, play a tune and save it as *PIANO/BIN*. Then, whenever

*"The editor is  
simple, but  
adequate..."*

you run the BASIC driver, it automatically loads the modified tables and becomes the new default. Have fun!

#### Key Memory Addresses

- &H3000 Execution address of play/compose segment.
- &H325A Execution address of playback segment.
- &H330D and &H330E LSB and MSB of address of last note played. POKE another address here to end playback at another note position.
- &H334C Address of first note of compositions.
- &H3262 and H3263 Holds LSB and MSB of address of first note played (usually holds &H334C). POKE another address here to begin playback at another note.
- &H3180 First byte of key table.
- &H3219 First byte of envelope Table 1.
- &H323A First byte of envelope Table 2.
- &H317E and &H317F Holds top-of-RAM (&H7F80 in 32K systems).

(You may direct questions about this program to the authors at RFD 1, Box 504, Shirley, MA 01464, phone 617-448-2681. Please enclose an SASE when writing.) ☐

#### Listing 3: PIANO

```

3000 8D 11 001000 001000 ORG $3000
3002 7F 3178 002000 START BSR INITLZ
3005 8E 3219 002100 CLR ENVT0G
3008 BF 3176 005000 LDX #ENVTA1
300B 30 88 1F 006000 STX ENVTAB
300E BF 317A 007000 LEAX +31,X
3011 20 1B 008000 STX ENDTAB
3013 B6 FF01 009000 BRA INKEY
3016 84 F7 010000 INITLZ LDA $FF01 INITIALIZE PIA'S
3018 B7 FF01 011000 ANDA #$F7
301B B6 FF03 012000 STA $FF01
301E 84 F7 013000 LDA $FF03
3020 B7 FF03 014000 ANDA #$F7
3023 B6 FF23 015000 STA $FF03
3026 8A 08 016000 LDA $FF23
3028 B7 FF23 017000 ORA #8
302B 1A 50 018000 STA $FF23
302D 39 00 019000 ORCC #$50
302E 1C FE 020000 RTS
3030 BE 3176 021000 INKEY ANDCC #$FE KEYBOARD POLLING
3033 BF 3173 022000 LDX ENVTAB
3036 FE 317C 023000 STX ENVPTR
3039 86 FF 024000 LDU ENVDLY
303B B7 FF02 025000 LDA #$FF
303E C6 FF 026000 STA $FF02
3040 5C 00 027000 IN010 LDB #$FF
3041 79 FF02 028000 IN020 INCB
3044 B6 FF00 029000 ROL $FF02
3047 8A 80 030000 LDA $FF00
3049 81 FF 031000 ORA #$80
304B 26 06 032000 CMPA #$FF
304D C1 07 033000 BNE PRINT
304F 26 EF 034000 CMPB #7
3051 20 DB 035000 BNE IN020
3053 34 04 036000 BRA INKEY
3055 B7 3175 037000 PRINT PSHS B
3058 C6 FF 037100 STA KEYSTR
305A 5C 00 038000 LDB #$FF
305B 46 00 039000 PRN020 INCB
305C 25 FC 040000 RORA
305E 86 08 041000 BCS PRN020
3060 3D 00 042000 LDA #8
3061 EB E4 043000 MUL
3063 35 02 044000 ADDB ,S
3065 C1 2F 045000 PULS A
3067 26 23 046000 CMPB #47 CHECK FOR ?/ KEY
3069 7C 3178 047000 BNE SHIFT
306C B6 3178 048000 INC ENVT0G
306F 44 00 049000 LDA ENVT0G
3070 25 0E 050000 LSRA
3072 8E 3219 051000 BCS ENV2
3075 BF 3176 052000 ENV1 LDX #ENVTA1
3078 30 88 1F 053000 STX ENVTAB
307B BF 317A 054000 LEAX +31,X
307E 20 0C 055000 STX ENDTAB
3080 8E 323A 056000 BRA SHIFT
3083 BF 3176 057000 ENV2 LDX #ENVTA2
3086 30 88 1F 058000 STX ENVTAB
3089 BF 317A 059000 LEAX +31,X
308C C1 37 060000 STX ENDTAB
308E 1027 021E 061000 SHIFT CMPB #55 CHECK FOR SHIFT KEY
3092 108E 30A2 062000 LBEQ SWI
3096 E1 A0 063000 LDY #NOKEY
3098 27 94 064000 CMPB ,Y+
309A 108C 30AA 065000 BEQ INKEY
309E 27 0A 066000 CMPY #NOKEY+8
30A0 20 F4 067000 BEQ PRN030
30A2 01 00 068000 BRA NOKEY1
30A3 06 00 069000 FCB 1 TABLE OF KEYS NOT PLAYED
30A4 0B 00 070000 FCB 6
30A5 1C 00 071000 FCB 11
30A6 20 00 072000 FCB 28
30A7 23 00 073000 FCB 32
30A8 27 00 074000 FCB 35
30A9 37 00 075000 FCB 39
30AA C1 1F 076000 FCB 55
30AC 26 31 077000 PRN030 CMPB #31 CHECK FOR SPACEBAR
30AE 7C 3179 078000 BNE ST001
30B1 B6 FF00 079000 INC TOGGLE
30B4 8A 80 080000 LDA $FF00
30B5 80 00 081000 WAIT2 LDA $FF00
30B6 80 00 081100 ORA #$80

```



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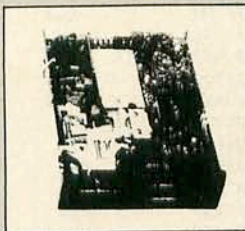
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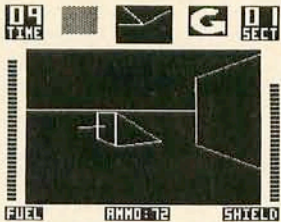
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39B6 81	FF	98299	CMFA	#\$FF	
39B8 26	F7	98399	BNE	WAIT2	
39BA 16	FF71	98499	LERA	INKEY	
39BD B6	FF99	98599	LDA	\$\$\$99	
39C9 8A	89	98519	ORA	#\$89	
39C2 81	FF	98699	CMFA	#\$FF	
39C4 26	F7	98799	BNE	WAIT	
39C6 BE	339D	98899	LDX	MEMORY	
39C9 86	29	98999	LDA	#32	
39CB A7	91	99099	STA	+1,X	
39CD 17	923F	99119	LBSR	TWEEN	
39D9 E7	92	99299	STB	+2,X	
39D2 39	93	99199	LEAX	+3,X	
39D4 BF	339D	99299	STX	MEMORY	
39D7 BC	317E	99399	CHPX	RAMEND	
39DA 24	69	99499	BHS	RETURN	
39DC 16	FF4F	99599	LERA	INKEY	
39DF C1	31	99699	CMFB	#49	CHECK FOR CLEAR
39E1 26	9F	99799	BNE	ST919	
39E3 BE	339D	99899	LDX	MEMORY	
39E6 39	1D	99999	LEAX	-3,X	
39E8 8C	334C	19999	CHPX	#COMPOS	
39EB 25	C4	19199	BLO	WAIT2	
39ED BF	339D	19299	STX	MEMORY	
39F9 29	BF	19599	BRA	WAIT2	
39F2 8E	3189	19699	LDX	#TABLE	
39F5 86	93	19799	LDA	#3	
39F7 3D		19899	MUL		
39F8 3A		19999	ABX		
39F9 A6	92	11999	LDA	+2,X	
39FB A7	9F 339D	11199	STA	[MEMORY]	
39FF EC	84	11299	STD	,X	
3191 34	96	11399	PSHS	A,B	
3193 A6	9F 3173	11499	LDA	[ENVPTR]	
3197 84	FC	11599	ANDA	#\$FC	
3199 E6	E4	11699	LDB	,S	
319B 8D	97	11799	BSR	SOUND	
319D 4F		11899	CLRA		
319E E6	61	11999	LDB	+1,S	
3119 8D	92	12999	BSR	SOUND	
3112 29	EF	12199	BRA	ST915	
3114 5A		12299	SOUND	DECB	
3115 26	2F	12399	BNE	ENVLOP	
3117 8A	92	12319	ORA	#2	
3119 B7	FF29	12499	STA	\$\$\$29	
311C B6	FF99	12599	LDA	\$\$\$99	SEE IF KEY STILL PRESSED
311F 8A	89	12519	ORA	#\$89	
3121 B1	3175	12699	CMFA	KEYSTR	
3124 27	1F	12799	BEQ	RETURN	
3126 32	64	12899	LEAS	+4,S	
3128 FC	3173	12999	LDD	ENVPTR	
312B B3	3176	13999	SUBD	ENVTAB	
312E BE	339D	13199	LDX	MEMORY	
3131 E7	91	13299	STB	+1,X	
3133 17	91D9	13219	LBSR	TWEEN	
3136 E7	92	13229	STB	+2,X	
3138 39	93	13239	LEAX	+3,X	
313A BF	339D	13249	STX	MEMORY	
313D BC	317E	13259	CHPX	RAMEND	
3149 24	93	13269	BHS	RETURN	
3142 16	FE29	13599	LERA	INKEY	
3145 39		13699	RETURN	RTS	
3146 33	5F	13799	ENVLOP	LEAU	-1,U
3148 1183	9999	13899	CMFU	#9	ENVELOPE COUNTDOWN
314C 26	C6	13999	BNE	SOUND	
314E FE	317C	14999	LDU	ENVLDY	
3151 BE	3173	14199	LDX	ENVPTR	
3154 39	91	14299	LEAX	+1,X	
3156 BC	317A	14399	CHPX	ENDTAB	
3159 27	95	14499	BEQ	RESET	
315B BF	3173	14599	STX	ENVPTR	
315E 29	B4	14699	BRA	SOUND	
3169 B6	3179	14799	RESET	LDA	TOGGLE
3163 44		14899	LSRA		
3164 25	95	14999	BCS	CONTIN	
3166 32	64	15999	LEAS	+4,S	
3168 16	FF52	15199	LERA	WAIT	
316B BE	3176	15299	CONTIN	LDX	ENVTAB
316E BF	3173	15399	STX	ENVPTR	
3171 29	A1	15499	BRA	SOUND	
3173	9999	15599	ENVPTR	FDB	9
3175	99	15519	KEYSTR	FCB	9
3176	9999	15699	ENVTAB	FDB	9
3178	99	15799	ENVTOG	FCB	9
3179	99	15899	TOGGLE	FCB	9
317A	9999	15999	ENDTAB	FDB	9
317C	944C	16999	ENVLDY	FDB	1999
317E	7FFF	16959	RAMEND	FDB	97FFF
3180	3F	16199	TABLE	FCB	63
3181	3F	16299	FCB	63	
3182	14	16399	FCB	29	
3183	91	16499	FCB	1	A
3184	91	16599	FCB	1	
3185	89	16699	FCB	128	
3186	1F	16799	FCB	31	B
3187	1F	16899	FCB	31	
3188	29	16999	FCB	32	
3189	25	17999	FCB	37	C
318A	25	17199	FCB	37	
318B	1D	17299	FCB	29	
318C	27	17399	FCB	39	D
318D	28	17499	FCB	49	
318E	1C	17599	FCB	28	
318F	99	17699	FCB	144	E
3199	99	17799	FCB	144	
3191	96	17899	FCB	6	
3192	91	17999	FCB	1	F
3193	91	18999	FCB	1	
3194	89	18199	FCB	128	
3195	29	18299	FCB	32	G
3196	21	18399	FCB	33	
3197	1F	18499	FCB	31	



3198	1D	18500	FCB	29	H	31CE	30	23900	FCB	48	Z
3199	1E	18600	FCB	30		31CF	2F	24000	FCB	47	
319A	21	18700	FCB	33		31D0	19	24100	FCB	25	
319B	53	18800	FCB	83	I	31D1	C1	24200	FCB	193	UP ARR
319C	53	18900	FCB	83		31D2	C1	24300	FCB	193	
319D	0F	19000	FCB	15		31D3	01	24400	FCB	1	
319E	1A	19100	FCB	26	J	31D4	01	24500	FCB	1	DN ARR
319F	1B	19200	FCB	27		31D5	01	24600	FCB	1	
31A0	23	19300	FCB	35		31D6	00	24700	FCB	128	
31A1	01	19400	FCB	1	K	31D7	37	24800	FCB	55	LT ARR
31A2	01	19500	FCB	1		31D8	39	24900	FCB	57	
31A3	00	19600	FCB	128		31D9	16	25000	FCB	22	
31A4	15	19700	FCB	21	L	31DA	31	25100	FCB	49	RT ARR
31A5	16	19800	FCB	22		31DB	31	25200	FCB	49	
31A6	26	19900	FCB	38		31DC	18	25300	FCB	24	
31A7	19	20000	FCB	25	M	31DD	00	25400	FCB	0	SPACE
31A8	19	20100	FCB	25		31DE	00	25500	FCB	0	
31A9	24	20200	FCB	36		31DF	00	25600	FCB	0	
31AA	1C	20300	FCB	28	N	31E0	01	25700	FCB	1	0
31AB	1C	20400	FCB	28		31E1	01	25800	FCB	1	
31AC	22	20500	FCB	34		31E2	00	25900	FCB	128	
31AD	48	20600	FCB	75	O	31E3	B6	26000	FCB	182	1
31AE	48	20700	FCB	75		31E4	B7	26100	FCB	183	
31AF	11	20800	FCB	17		31E5	02	26200	FCB	2	
31B0	47	20900	FCB	71	P	31E6	A2	26300	FCB	162	2
31B1	47	21000	FCB	71		31E7	A2	26400	FCB	162	
31B2	12	21100	FCB	18		31E8	04	26500	FCB	4	
31B3	AC	21200	FCB	172	Q	31E9	01	26600	FCB	1	3
31B4	AC	21300	FCB	172		31EA	01	26700	FCB	1	
31B5	03	21400	FCB	3		31EB	00	26800	FCB	128	
31B6	00	21500	FCB	128	R	31EC	08	26900	FCB	136	4
31B7	00	21600	FCB	128		31ED	08	27000	FCB	136	
31B8	08	21700	FCB	8		31EE	07	27100	FCB	7	
31B9	2D	21800	FCB	45	S	31EF	78	27200	FCB	120	5
31BA	2D	21900	FCB	45		31F0	79	27300	FCB	121	
31BB	1A	22000	FCB	26		31F1	00	27400	FCB	9	
31BC	71	22100	FCB	113	T	31F2	6B	27500	FCB	107	6
31BD	71	22200	FCB	113		31F3	6B	27600	FCB	107	
31BE	0A	22300	FCB	10		31F4	0B	27700	FCB	11	
31BF	5E	22400	FCB	94	U	31F5	01	27800	FCB	1	7
31C0	5E	22500	FCB	94		31F6	01	27900	FCB	1	
31C1	0D	22600	FCB	13		31F7	00	28000	FCB	128	
31C2	22	22700	FCB	34	V	31F8	58	28100	FCB	88	8
31C3	22	22800	FCB	34		31F9	59	28200	FCB	89	
31C4	1E	22900	FCB	30		31FA	0E	28300	FCB	14	
31C5	98	23000	FCB	152	W	31FB	4F	28400	FCB	79	9
31C6	98	23100	FCB	152		31FC	4F	28500	FCB	79	
31C7	05	23200	FCB	5		31FD	10	28600	FCB	16	
31C8	2A	23300	FCB	42	X	31FE	43	28700	FCB	67	*
31C9	2A	23400	FCB	42		31FF	43	28800	FCB	67	
31CA	1B	23500	FCB	27		3200	13	28900	FCB	19	
31CB	65	23600	FCB	101	Y	3201	13	29000	FCB	19	+
31CC	65	23700	FCB	101		3202	13	29100	FCB	19	
31CD	0C	23800	FCB	12		3203	28	29200	FCB	40	

## About The One-Liner Contest . . .

THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be very short.

Send your entry (preferably on cassette) to:

THE RAINBOW One-Liner Contest  
P.O. Box 385  
Prospect, KY 40059

3204	17	29300	FCB	23	<	3209	15	29800	FCB	21	
3205	17	29400	FCB	23		320A	14	29900	FCB	20	>
3206	25	29500	FCB	37		320B	14	30000	FCB	20	
3207	3B	29600	FCB	59	-	320C	27	30100	FCB	39	
3208	3B	29700	FCB	59		320D	01	30200	FCB	1	?
3209	15	29800	FCB	21		320E	01	30300	FCB	1	
320A	14	29900	FCB	20		320F	64	30400	FCB	100	
320B	14	30000	FCB	20		3210	05	30500	FCB	5	ENTER
320C	27	30100	FCB	39		3211	05	30600	FCB	5	
320D	01	30200	FCB	1		3212	FF	30700	FCB	255	
320E	01	30300	FCB	1		3213	01	30800	FCB	1	CLEAR
320F	64	30400	FCB	100		3214	01	30900	FCB	1	
3210	05	30500	FCB	5		3215	64	31000	FCB	100	
3211	05	30600	FCB	5		3216	34	31100	FCB	52	BREAK
3212	FF	30700	FCB	255		3217	34	31200	FCB	52	
3213	01	30800	FCB	1		3218	17	31300	FCB	23	
3214	01	30900	FCB	1		3219	FF	31400	ENVTA1	FCB	255
3215	64	31000	FCB	100		321A	CA	31500	FCB	202	
3216	34	31100	FCB	52		321B	AA	31600	FCB	170	
3217	34	31200	FCB	52		321C	91	31700	FCB	145	
3218	17	31300	FCB	23		321D	7E	31800	FCB	126	
3219	FF	31400	ENVTA1	FCB	255	321E	6B	31900	FCB	107	
321A	CA	31500	FCB	202		321F	5B	32000	FCB	91	
321B	AA	31600	FCB	170		3220	50	32100	FCB	80	
321C	91	31700	FCB	145		3221	46	32200	FCB	70	
321D	7E	31800	FCB	126		3222	3D	32300	FCB	61	
321E	6B	31900	FCB	107		3223	35	32400	FCB	53	
321F	5B	32000	FCB	91		3224	2D	32500	FCB	45	
3220	50	32100	FCB	80		3225	28	32600	FCB	40	
3221	46	32200	FCB	70		3226	22	32700	FCB	34	
3222	3D	32300	FCB	61		3227	1D	32800	FCB	29	
3223	35	32400	FCB	53		3228	1A	32900	FCB	26	
3224	2D	32500	FCB	45		3229	17	33000	FCB	23	
3225	28	32600	FCB	40		322A	15	33100	FCB	21	
3226	22	32700	FCB	34		322B	12	33200	FCB	18	
3227	1D	32800	FCB	29		322C	10	33300	FCB	16	
3228	1A	32900	FCB	26		322D	0F	33400	FCB	15	
3229	17	33000	FCB	23		322E	0D	33500	FCB	13	
322A	15	33100	FCB	21		322F	0C	33600	FCB	12	
322B	12	33200	FCB	18		3230	0A	33700	FCB	10	
322C	10	33300	FCB	16		3231	09	33800	FCB	9	
322D	0F	33400	FCB	15		3232	08	33900	FCB	8	
322E	0D	33500	FCB	13		3233	07	34000	FCB	7	
322F	0C	33600	FCB	12		3234	06	34100	FCB	6	
3230	0A	33700	FCB	10		3235	05	34200	FCB	5	
3231	09	33800	FCB	9		3236	04	34300	FCB	4	
3232	08	33900	FCB	8		3237	03	34400	FCB	3	
3233	07	34000	FCB	7		3238	02	34500	FCB	2	
3234	06	34100	FCB	6		3239	01	34600	FCB	1	
3235	05	34200	FCB	5		323A	FF	34700	ENVTA2	FCB	255
3236	04	34300	FCB	4		323B	89	34800	FCB	137	ENVELOPE TABLE #2



```

323C 44 34999 FCB 68
323D 94 35999 FCB 4
323E E6 35199 FCB 239
323F 95 35299 FCB 149
3249 41 35399 FCB 65
3241 94 35499 FCB 4
3242 D2 35599 FCB 219
3243 91 35699 FCB 145
3244 41 35799 FCB 65
3245 94 35899 FCB 4
3246 C9 35999 FCB 192
3247 79 36999 FCB 121
3248 41 36199 FCB 65
3249 94 36299 FCB 4
324A AD 36399 FCB 173
324B 79 36499 FCB 112
324C 34 36599 FCB 52
324D 94 36699 FCB 4
324E 9A 36799 FCB 154
324F 63 36899 FCB 99
3259 2C 36999 FCB 44
3251 94 37999 FCB 4
3252 86 37199 FCB 134
3253 54 37299 FCB 84
3254 29 37399 FCB 41
3255 94 37499 FCB 4
3256 74 37599 FCB 116
3257 48 37699 FCB 72
3258 22 37799 FCB 34
3259 99 37899 FCB 9
325A 17 FDB6 37999 PLAYBK LBSR INITLZ PLAYBACK SEGMENT
325D 7F 3178 37919 CLR ENVTG
3269 198E 334C 38999 LDY #COMPOS
326A 8E 3219 38199 LDY #ENVTA1
3267 BF 3176 38299 STX ENVTAB
326A FE 317C 38399 PLY995 LDU ENVDLY
326D BE 3176 38499 LDY ENVTAB
3279 BF 3173 38599 STX ENVPTR
3273 19BC 339D 38699 PLY919 CMFY MEMORY
3277 27 37 38799 BEQ SWI
3279 E6 21 38899 LDB +1,Y
327B BE 3176 38999 LDY ENVTAB
327E 3A 39999 ABX
327F BF 32B1 39199 STX ENVPT2
3282 E6 A4 39299 LDB ,Y
3284 8E 3189 39399 LDY #TABLE
3287 C1 64 39499 CMFB #199
3289 26 1D 39519 BNE PLY929
328B 7C 3178 39529 INC ENVTG
328E B6 3178 39539 LDA ENVTG
3291 44 39549 LSRA
3292 25 9A 39559 BCS ENV22
3294 8E 3219 39569 LDY #ENVTA1
3297 BF 3176 39999 STX ENVTAB
329A 31 23 49999 LEAY +3,Y
329C 29 CC 49199 BRA PLY995
329E 8E 323A 49299 ENV22 LDY #ENVTA2
32A1 BF 3176 49399 STX ENVTAB
32A4 31 23 49499 LEAY +3,Y
32A6 29 C2 49599 BRA PLY995
32A8 E1 92 49699 CMFB +2,X
32AA 27 97 49799 BEQ FOUND
32AC 39 93 49899 LEAX +3,X
32AE 29 F8 49999 BRA PLY929
32B9 39 41999 SWI RTS
32B1 9999 41199 ENVPT2 FDB 9
32B3 EC 84 41299 FOUND LDD ,X
32B5 34 96 41399 PSHS A,B
32B7 A6 9F 3173 41499 PLY939 LDA [ENVPTR]
32B8 E6 A4 41599 LDB ,Y
32BD C1 FF 41699 CMFB #255
32BF 26 91 41799 BNE PLY949
32C1 4F 41899 CLRA
32C2 E6 E4 41999 PLY949 LDB ,S
32C4 8D 97 42999 BSR SND
32C6 4F 42199 CLRA
32C7 E6 61 42299 LDB +1,S
32C9 8D 92 42399 BSR SND
32CB 29 EA 42499 BRA PLY939
32CD 5A 42599 SND DECB
32CE 26 28 42699 BNE ENV
32D9 8A 92 42619 ORA #2
32D2 B7 FF29 42799 STA $FF29
32D5 BE 3173 42899 CKSTOP LDY ENVPTR
32D8 BC 32B1 42999 CMFB ENVPTR
32DB 1923 FE66 43999 LBLR RETURN
32DF 8D 55 43992 BSR BETWN
32E1 CE 9932 43919 LDU #59
32E4 33 5F 43929 PLYDLY LEAU -1,U
32E6 1183 9999 43939 CMFU #9
32EA 26 F8 43949 BNE PLYDLY
32EC 39 91 43199 LEAX +1,X
32EE BF 3173 43299 STX ENVPTR
32F1 32 64 43399 LEAS +4,S
32F3 31 23 43499 LEAY +3,Y
32F5 16 FF72 43599 BRA PLY995
32F8 33 5F 43699 ENV LEAU -1,U
32FA 1183 9999 43799 CMFU #9
32FE 26 CD 43899 BNE SND
3309 FE 317C 43999 LDU ENVDLY
3303 BE 3173 44099 LDY ENVPTR
3306 39 91 44199 LEAX +1,X
3308 BF 3173 44299 STX ENVPTR
3309 29 C9 44399 BRA SND
330D 334A 44499 MEMORY FDB $334A
330F C6 91 44459 TWEEN LDB #1
3311 7F FF92 44599 CLR $FF92
3314 B6 FF99 44699 TWEEN9 LDA $FF99
3317 8A 89 44619 ORA #89

```

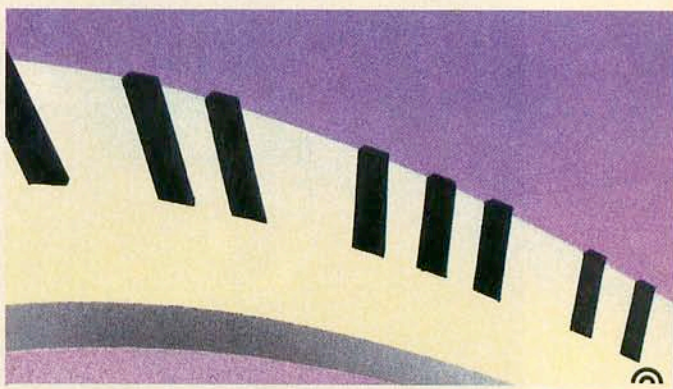
```

3319 81 FF 44799 CMFA #FFF
331B 1926 FE26 44899 LBNE RETURN
331F 4F 44999 CLRA
3329 1921 FD9A 44919 TWEEN3 LBRN INKEY
3324 1921 FD96 44929 LBRN INKEY
3328 4C 45999 INCA
3329 27 92 45199 BEQ TWEEN4
332B 29 F3 45299 BRA TWEEN3
332D 5C 45399 TWEEN4 INCB
332E C1 FF 45499 CMFB #FFF
3339 1927 FE11 45599 LBEQ RETURN
3334 29 DE 45699 BRA TWEEN9
3336 5F 45799 BETWN CLRB
3337 4F 45899 BETWN1 CLRA
3338 1921 FCF2 45999 BETWN2 LBRN INKEY
333C 1921 FCEE 46999 LBRN INKEY
3349 4C 46199 INCA
3341 26 F5 46299 BNE BETWN2
3343 5C 46399 INCB
3344 E1 22 46499 CMFB +2,Y
3346 1927 FF66 46599 LBEQ SWI
334A 29 EB 46699 BRA BETWN1
334C 99 46799 COMPOS FCB 9
325A 46899 END PLAYBK

```

FIRST BYTE STORED MUSIC DATA

99999 TOTAL ERRORS



## Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary explaining how the program works. Generally, we're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

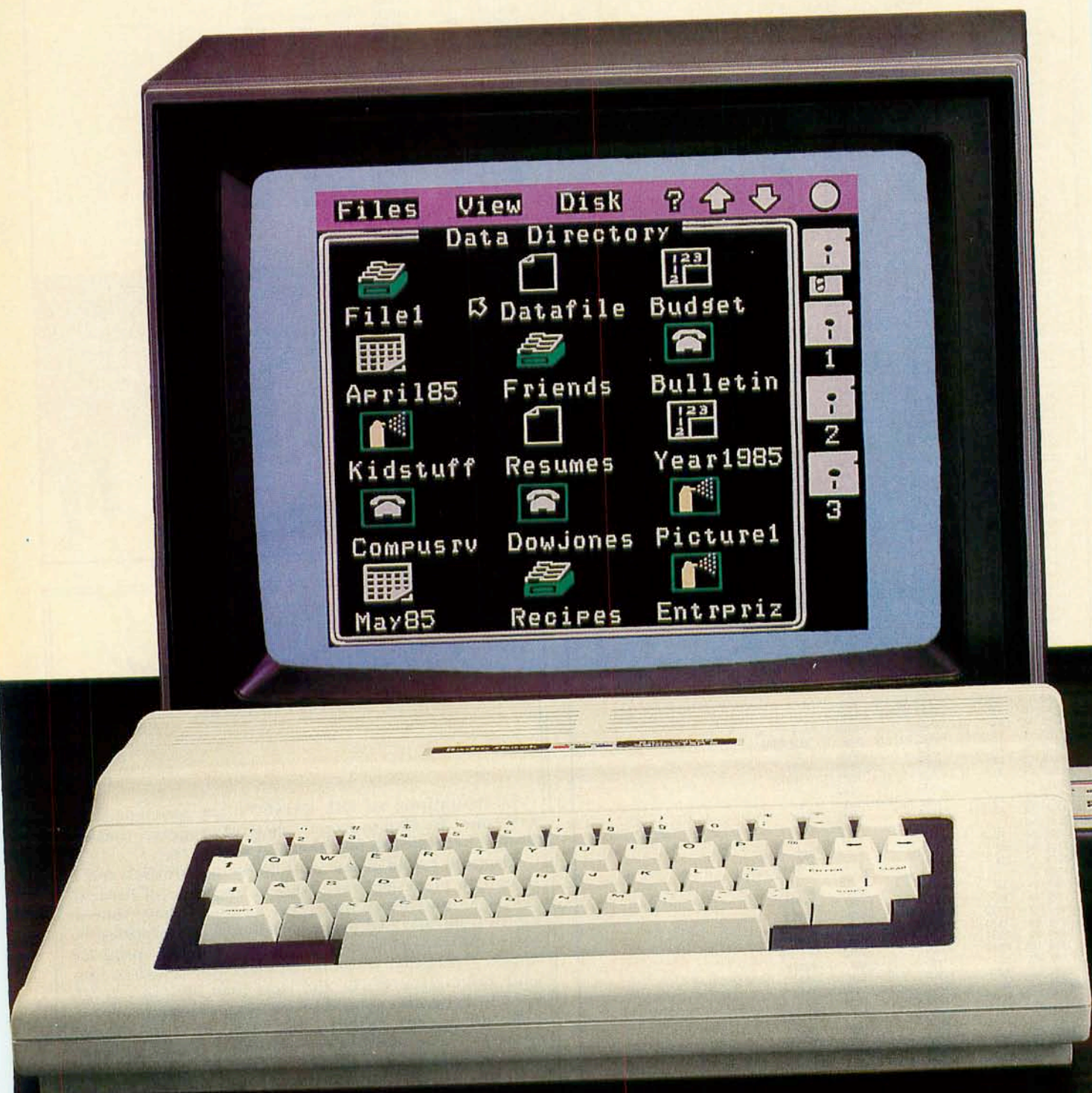
We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submissions Editor, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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**INDEX CARDS**

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# Enhance Presentations with Text Panel Formatting

By Joseph Kolar  
Rainbow Contributing Editor

**N**ow hear this! I have developed 20 tutorials using Hi-Res graphics for the 16K ECB CoCo. Before presenting this 20-month series, I invite all interested readers to make their wishes known. Drop me a line and register your vote. Would you prefer that we continue our leisurely stroll through BASIC? Or would you like to settle in for a long session with Hi-Res graphics?

Our agenda for today is the text screen and how to format text panels in an interesting manner to enhance their presentation.

In many educational programs, text must be used extensively to explain or develop a theme. It behooves the novice programmer to make the text on the screen as appealing as possible. About two years ago, I presented a tutorial on this subject. To the newer readers of this column, what you learn here will stand you in good stead.

Hint for today. When keying in program lines, look at the TV/monitor screen and watch the characters appear

*Florida-based Joseph Kolar is a veteran writer and programmer and specializes in introducing beginners to the powers of CoCo.*

as they are typed in rather than looking at your fingers. You will find that typing errors can be spotted as they are committed and can be corrected before completing the program line. There are two advantages to this: You will gradually develop a touch-typing system as you are weaned from being mesmerized by the keyboard and it eliminates a lot of errors before pressing ENTER.

When the program is run it may not produce an error message. It may carry an embarrassing misspelling in an otherwise impeccable program. When it is discovered, creative time is wasted searching out the right program line, correcting it and running the program to verify the correction. It is difficult enough to program without the bother of debugging silly spelling errors.

The veterans may want to skip Listing 1 and Listing 2 because they are old hat. Newcomers, key in Listing 1, carefully typing in the lines as they appear in the listing. Run the program. Press any key to advance. Faithfully follow the instructions. Perform all actions called for enclosed in brackets. If you skip over parts of the text/instructions, you will not get the entire picture.

Once this tutorial is completed, Line 2000 is altered. Refer to the listing and

restore the line to its original condition.

In the educational program that we are going to develop in the next few months, we will be doing a lot of programming directly from the screen. Understanding how to format text and position a sentence(s) on the screen so it doesn't look disjointed or unbalanced is important. It's imperative that you practice programming sentences to make neat, well-placed text for display on the screen or you may encounter trouble later.

Long REM statements in a listing should be formatted with a different view in mind. REM statements are dormant during the execution of a program. When they are revealed in the course of listing a program, they must be neat, logical and readable just as text lines on the screen.

Forget the "invisible vertical line" gambit. Look at the screen and compose, alter and adjust the REM statement lines so they are instantly recognizable and readable.

Key in Listing 2. When finished, list it line by line, beginning with 3000 through 3080. The listing is the tutorial! Those who know how, may want to append Listing 2 to Listing 1.

Listing 3 is practically one giant



GOSUB program. It could have been divided further, but after a point too many GOSUBs can be counter-productive. Aside from the usual one-panel-at-a-time presentation of text on the screen, we will demonstrate scrolling, simple substitution and complex substitution methods.

Key in Listing 3. Line 10 demonstrates the usual panel replacement method (Lines 100-101, 110-111, 120 and 122).

The panels of text must be carefully crafted to fit in the available screen space. This means the contents of each panel may have to be revised. (Add a few words or delete a few words.)

Beginning with Line 123 and continuing through Line 128, the program changes to the scrolling method. Each set of definitions is scrolled upwards. Note that each set covers about one-half of the screen rows to maintain a nice, two-set display at all times.

The columns in each set created were based on one of the techniques in a tutorial we discussed a few months ago. It should be familiar, so we won't beat it to death. Here is a question to ponder — Why are there four commas after "red" in Line 123 rather than three commas after "English" in Line 122?

The languages in column one are Germanic and those in column two are Romance. It is easy to spot the similarities in the words in the two columns. Examine the "black" set. The three Germanic definitions are very closely related, as are the three Romance ones. They are called cognates; words that are linguistically related and that may have a common origin. The obsolete English word for "black" is "swart," which exists today in "swarthy." The progenitor of the Romance languages is Latin, while that of the Germanic trio is a hypothetical proto-Germanic language. "Black" is related to an old Anglo-Saxon form of unknown origin.

The simple substitution method can be observed in the text presentation in lines 20 and 30. Here the panel remains in place. The definitions are replaced simultaneously as one unit. Line 120, on the top half of the screen, briefly comments on the word lists to be depicted.

The bottom half of the display panel uses the same group of GOSUBs that were used in Line 10 to create the combo panel replacement and scrolling method. Note that in Line 20, PRINT@ ,255,"" becomes GOSUB200 in Line 30.

In order to utilize the same GOSUBs, we decided to print "nothing" in the last space on the right-hand side of the row above our starting row (beginning at space 256). The idea is to maintain the integrity of GOSUBs 122 through 128 and to maintain the same vertical location at all times. Also, the text on the top half of the screen is not partially scrolled up and off the screen. The PRINT@ allows us to designate the location of a GOSUB statement without altering its contents, which ends it effectively as a GOSUB.

Change the first 255 in Line 20 to 256 and you see how it ruins an effect we tried hard to achieve.

Line 40 uses the complex-substitution method. If you want sound, turn up the volume.

Line 300 sets the values for the location of the seven entries that will be substituted, one at a time, in each set. X\$ is used as a blanking-out string variable.

Line 301 sets up the abbreviations that will remain in place throughout this program segment.

Line 303 locates and prints the "red" set. Between each PRINT@ word, there appears a slight pause and a sound, courtesy of GOSUB400. Note the ';' after the entries that contain 'B', 'D' and 'F'. They are required after the left-hand column. If they are omitted, the right-hand column is wiped out, losing the abbreviations that were meant to remain undisturbed.

Line 305 blanks out the definitions and pauses for two seconds.

Note that lines 303 and 310 end with EXEC44539:GOSUB305:RETURN. It waits for a key to be pressed, blanks out the definitions and returns. The temptation was too great to resist. A GOSUB500 was created to continue this program.

Line 99 was a temporary stop that became dormant once the program, (lines 10 through 40) was finished and a loop to repeat (Line 50) was added.

Line 399 ends the program abruptly and keeps the sound (GOSUB400) separated from the complex substitution segment. Delete or mask Line 399 with a REM and see what happens!

After CoCo runs through the complex substitution sets, instead of coming to the intended screeching halt, it goes berserk and makes three ever-decreasing loops encompassing white-yellow-green, yellow-green and green, before going back to the start of the program.

Obviously, CoCo is innocent. There is a hidden semi-error in the listing that is suppressed when 399 GOTO 399 is used. Guess who made the error. Can you track it down and save my day?

TRON and TROFF, the debugging aids, are often both useless and confusing in a large program. Listing 3 is ideally suited to try out the TRON feature of ECB.

Press BREAK, type in TRON, press ENTER and RUN. You'd think this program was made to order to demonstrate

---

### *"If it works, don't fool with it!"*

---

TRON. Each number enclosed in square brackets gives the program line number that is executed.

If you follow it slowly, you will be able to determine at what point I caused CoCo to veer from the straight and narrow. It will nudge you toward the error(s). Put on your thinking cap and locate the mistake(s).

Sometimes, as happened in this program, it is possible to create a viable program with a submerged, latent error that is not readily apparent. If this program is enlarged and altered to head in a new direction, the error can surface and force you to cope with it. My motto is, "If it works, don't fool with it!"

With the TRON on, note that lines 10 through 40 are not displayed. Rather, all the GOSUBs are nicely labeled. Lines 200, 300, 301 and 400, which remain set at some point in the program, are in a stationary location. This is particularly obvious in the complex substitution segment.

Program lines that do nothing are not noted, such as locations that are not executed. Only that which is in the location is executed.

Work through Listing 3 with TRON and compare each bracketed number with the listing line number. You will find it helpful and enjoyable to romp through the program with CoCo. If you find the mistake, good. If not, have fun exploring this debugging tool anyway, and when finished, remember to pluck the REM out of Line 399 and get out of TRON mode with BREAK, TROFF and ENTER.

Everytime you turn on CoCo and program, you are having a learning experience. Enjoy it! □



# Listing 1: TUTOR 1

```

0 '<LISTING1>
10 CLS:GOSUB2000
11 '<RUN> THIS AND SEE HOW ODD I
T LOOKS!
12 EXEC44539:PRINT" NOTE THE ST
ARTING SPACE IN THESECOND LINE O
F TEXT!
13 EXEC44539:PRINT:PRINT" NOTE
HOW 'THAT' IS SPLIT ONTO TWO LIN
ES!"
14 EXEC44539:PRINT:PRINT" <BREA
K> <LIST2000> STUDY THE DISPLAY
! WHAT MUST BE DONE TO MOVE TH
E SECOND LINE ONE SPACE TO THE
LEFT? WHEN READY <RUN15><PRESS
ANY KEY>"
15 EXEC44539:GOSUB2000:
16 EXEC44539:PRINT" WE MUST DEL
ETE THE BLANK SPACEAT THE BEGINN
ING OF THE SECOND LINE BETWEEN
THE WORDS 'TEXT' AND 'IN'. DO
SO NOW! <BREAK> <EDIT2000> <4
2> <SPACEBAR> <D> <ENTER> <RUN1
8> <PRESS A KEY>."
18 EXEC44539:GOSUB2000:PRINT:PRI
NT" NOTE 'THA' OF 'THAT' MUST B
E MOVED TO THE NEXT LINE. <BRE
AK><EDIT2000> AND INSERT THREE
SPACES SO THAT 'THA' IS PUSHE
D TO THE NEXT LINE. <71> <SPAC
E- BAR> <I> <SPACEBAR (3 TIMES)>
"
19 PRINT"<ENTER> <RUN20> <PRESS
KEY>."
20 EXEC44539:GOSUB2000:PRINT" N
OTE THAT THE LEFT MARGIN BE- GIN
S VERTICALLY WITH A BLANK SPA
CE;I;T. <BREAK> <LIST2000> AND
NOTE WHERE THIS SEQUENCE OF LET
TERS FALL. <RUN21> <PRESS>."
21 EXEC44539:GOSUB2000:PRINT" I
F YOU DREW AN INVISIBLE, VER
TICAL LINE YOU WOULD NOTE THA
T THIS FIRST COLUMN OF CHAR- ACT
ERS/SPACES FELL IMMEDIATELY TO
THE RIGHT OF THE STARTING 'QU
OTE MARK'."
22 EXEC44539:GOSUB2000:PRINT" N
OW YOU KNOW WHERE TO BEGIN EAC
H LINE OF TEXT AS YOU ARE KEY
ING IT IN. IF A WORD MUST BE BRO
KEN UP INTO SYLLABLES, THE TEC
HNIQUE IS THE SAME."
23 PRINT" TO SEE HOW LINE22, (A
BOVE PARAGRAPH), WAS ALLIGNE
D <BREAK><LIST22> SEE THE INVISI
BLE LINE AFTER THE STARTING QUOT

```

```

E MARK? <RUN24> <PRESS A KEY>"
24 EXEC44539:PRINT" SPACE;E;K;B
;T":PRINT:PRINT" NO MATTER WHER
E THE START OF THE TEXT LINE BE
GINS IN A ROW, THE INVISIBLE LI
NE BEGINS RIGHT AFTER THE OPENIN
G QUOTE MARK OF THAT PARTICULAR
SENTENCE. "
25 EXEC44539:CLS:PRINT:PRINT" R
EMEMBER THAT THAT OPENING QUO
TE MARK IS THE VISUAL HINT ON THE
SCREEN, AS YOU KEY IN A PRO-GRA
M LINE. IT ALERTS YOU WHEN YOU
ARE REACHING THE END OF A TEX
T LINE OF 32 CHARACTERS/SPACES."
26 PRINT:PRINT" THE RIGHT-MARGI
N WILL BE DI- RECTLY UNDER THE
OPENING QUOTE MARK. ANY WORD T
HAT EXTENDS PAST THE 32ND, RI
GHT MARGIN SPACE, WILL HAVE
TO BE ADJUSTED, IN WHOLE OR IN PA
RT!"
27 EXEC44539:PRINT:PRINT" IF TH
E ENTIRE WORD MUST BE PLACED
ON THE NEXT LINE, THE SPACES
BETWEEN THE LAST FULL WORD AT
THE END OF THE ROW AND THE 1ST
SPACE OF THE NEXT ROW, WHERE T
HE 1ST LETTER OF THE NEXTWORD WI
LL BEGIN, MUST BE FILLED"
28 PRINT"WITH BLANK 'SPACES'."
29 EXEC44539:PRINT:PRINT" IF TH
E WORD CAN BE BROKEN UP INTO SY
LLABLES, CONSIDER THE TWO PARTS
TO BE TWO WORDS; THE FIRSTWORD, (
PART), IS FOLLOWED BY A HYPHEN.
"
30 EXEC44539:PRINT:PRINT" THE B
ALANCE OF THE ROW IS FILLED
WITH 'BLANK SPACES'. THESECOND
WORD, (PART), BEGINS AT THE INV
ISIBLE LINE THAT MARKS OFF THE
LEFT-MARGIN. YOU CAN FIGURE
OUT THE FORMAT FROM THE SCREEN
AS YOU CREATE THE TEXT
31 PRINT"LINE."
32 EXEC44539:PRINT:PRINT" IF YO
U WANT TO DO THE WHOLE TUTORIA
L OVER, EDIT LINE2000, BYINSERTI
NG A SPACE BETWEEN 'TEXT'AND 'IN
' AND DELETE 3 SPACES AF-TER 'SO
'. <RUN>. IF NOT, <PRESS A KEY>."
33 EXEC44539:CLS:PRINT@202," TH
E END!"
34 GOTO34
2000 CLS:PRINT" WE WANT TO PRIN
T LINES OF TEXT IN A NEAT, LOGIC

```



AL MANNER SO THAT A PLEASING DISPLAY RESULTS.":PRINT:RETURN

## Listing 2: TUTOR 2

```
Ø '<LISTING2>
3ØØØ REM THIS IS THE WAY A RAW REM LINE MIGHT LOOK, IF IT WERE KEYPED IN.-----<LIST ONE LINE AT A TIME TO FOLLOW THIS TUTORIAL>.
3Ø1Ø 'IT WOULD BE A GOOD IDEA TO HIGHLIGHT IT WITH A STRING OF 3 STARS.
3Ø2Ø '***THIS MAKES IT STAND OUT SO IT CAN BE EASILY LOCATED.
3Ø3Ø '***DID YOU NOTICE IN LINE 3Ø2Ø THAT THE SPACE AFTER 'OUT' WAS DELETED SO THAT 'SO' WOULD RUN AT THE LEFT MARGIN?
3Ø4Ø '***DID YOU NOTE THAT IN LINE3Ø3Ø, THE 'R' IN 'RUN' WAS PUSHED DOWN, VIA A SPACE SO IT BEGAN AT THE LEFT MARGIN?
3Ø5Ø '***IN LINE3Ø4Ø, YOU NOTICED THREE 'PUSHES' TO MAKE THE WORDS BEGIN AT THE LEFT MARGIN!
3Ø6Ø '***DID YOU SEE HOW 'NOTICED' WAS SYLLABLIZED? IF IT WERE NOT, THE 'D' OF 'NOTICED' IN LINES 3Ø4Ø AND 3Ø5Ø WOULD BE HANGING ON THE NEXT LINE AND MAYBE ADVERSELY AFFECT OTHER WORDS IN A LONG REM LINE.
3Ø7Ø '***REMEMBER, YOU SHOULD BE COMPOSING AND FORMATING REMS AT THE SAME TIME. YOU GET WHATEVER REM LINE THAT YOU SEE ON THE SCREEN AS YOU CREATE IT. ADJUST THE LINES AS YOU KEY THEM IN.
3Ø8Ø '***WHEN YOU HAVE A GROUP OF REM LINES, YOU MAY FIND IT OF VALUE TO SEPARATE THEM WITH A LINE LIKE THE FOLLOWING:
```

<3Ø75 '\*\*\*> OR <3Ø75 '>

NOW MAKE A REAL LINE3Ø75 AND SEE HOW NICELY IT SEPARATES REM STATEMENTS 3Ø7Ø-3Ø8Ø. <LIST>

## Listing 3: GOSUBTUT

```
Ø '<LISTING3>
5 CLS:PRINT@194,"TO ADVANCE, PRESS ANY KEY":PRINT:PRINT" WELL, WHAT ARE YOU WAITING FOR? ":EXEC44539
1Ø CLS:GOSUB1ØØ:GOSUB11Ø:GOSUB12Ø:GOSUB123:GOSUB124:GOSUB125:GOSUB126:GOSUB127:GOSUB128
2Ø CLS:GOSUB12Ø:PRINT@255,"":GOS
```

```
UB123:PRINT@255,"":GOSUB124:PRINT@255,"":GOSUB125:PRINT@255,"":GOSUB126:PRINT@255,"":GOSUB127:PRINT@255,"":GOSUB128
3Ø CLS:GOSUB12Ø:GOSUB2ØØ:GOSUB123:GOSUB2ØØ:GOSUB124:GOSUB2ØØ:GOSUB125:GOSUB2ØØ:GOSUB126:GOSUB2ØØ:GOSUB127:GOSUB2ØØ:GOSUB128
4Ø CLS:GOSUB12Ø:GOSUB3ØØ:GOSUB3Ø1:GOSUB3Ø3:GOSUB31Ø:GOSUB315:GOSUB32Ø:GOSUB325:GOSUB33Ø
5Ø GOTO1Ø
99 GOTO99
1ØØ PRINT:PRINT" LET US EXPLORE A FEW METHODS THAT ALLOW US TO PLACE PANELS OFTEXT ONTO THE SCREEN IN A MANNER DESIGNED TO AVOID REPETITION, BORDDOM AND PREDICTABILITY."
1Ø1 PRINT:PRINT" THE FIRST METHOD THAT COMES TOMIND, IS MERELY, TO CLEAR THE SCREEN AND SPLAT ON THE NEXT PANEL. THIS SYSTEM REQUIRES CARE IN PREPARING BLOCKS OF TEXTTHAT FIT EACH PANEL.":EXEC44539:RETURN
11Ø CLS:PRINT:PRINT" THE CHANCES ARE THAT YOU WILL HAVE TO EXPE
```

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```

RIMENT AND REWORD THE TEXT TO
MAKE IT LOOK WELL- CENTERED, BO
TH HORIZONTALLY AND VERTICALLY.
111 PRINT:PRINT" THE SAMPLE DIS
PLAY THAT WE AREGOING TO CREATE
IS A LIST OF NAMES OF COLORS
IN SIX LAN- GUAGES. WE SHAL
L PRESENT THEM IN THREE DIFFERE
NT STYLES TO ADDVARIETY IN OUR P
ROGRAMMING. ":EXEC44539:RETURN
120 CLS:PRINT" THE FOLLOWING LI
ST CONTAINS THE NAME OF COLORS
THAT ARE VERYSIMILAR IN SOUND I
N MANY CASES. THESE SIMILARLY
SPELLED AND PRONOUNCED WORDS A
RE COGNATES; WORDS THAT HAVE A
COMMON ANCES- TOR LANGUAGE. ":PR
INT
122 PRINT:PRINT" ENGL
ISH",,, "GERMAN","FRENCH"," DU
TCH","SPANISH"," SWEDISH","ITAL
IAN":PRINT:EXEC44539:RETURN
123 PRINT:PRINT" RED"
,,,"GER. ROT","FR. ROUGE","DU.
ROOD","SP. ROJO","SW. ROD","IT
. RUSSO":PRINT:EXEC44539:RETURN
124 PRINT:PRINT" BLU
E",,, "GER. BLAU","FR. BLEU","DU.
BLAUW","SP. AZUL","SW. BLA","
IT. AZZURO":PRINT:EXEC44539:RETU
RN
125 PRINT:PRINT" BLAC
K",,, "GER. SCHWARZ","FR. NOIR"
,"DU. ZWART","SP. NEGRO","SW.
SVART","IT. NERO":PRINT:EXEC
44539:RETURN
126 PRINT:PRINT" WHIT
E",,, "GER. WEISS","FR. BLANC",
"DU. WIT","SP. BLANCO","SW.
VIT","IT. BIANCO":PRINT:EXEC44
539:RETURN
127 PRINT:PRINT" YELL
OW",,, "GER. GELB","FR. JAUNE",

```

```

"DU. GEEL","SP. AMARILLO","SW
. GUL","IT. GIALLO":PRINT:EXE
C44539:RETURN
128 PRINT:PRINT" GREE
N",,, "GER. GRUEN","FR. VERT","
DU. GROEN","SP. VERDE","SW.
GRON","IT. VERDE":PRINT:EXEC44
539:RETURN
200 PRINT@255,"":RETURN
300 A=300:B=356:C=372:D=388:E=40
4:F=420:G=436:X$="
301 PRINT@300,"ENGLISH",,, "GR.",
"FR.", "DU.", "SP.", "SW.", "IT.":FO
RX=1TO400:NEXT:RETURN
303 PRINT@A,"RED":GOSUB400:PRINT
@B,"ROT";:GOSUB400:PRINT@C,"ROUG
E":GOSUB400:PRINT@D,"ROOD";:GOSU
B400:PRINT@E,"ROJO":GOSUB400:PRI
NT@F,"ROD";:GOSUB400:PRINT@G,"RU
SSO":EXEC44539:GOSUB305:RETURN
305 PRINT@A,X$:PRINT@B,X$;:PRINT
@C,X$:PRINT@D,X$;:PRINT@E,X$:PRI
NT@F,X$;:PRINT@G,X$:FORX=1 TO 10
00:NEXT:RETURN
310 PRINT@A,"BLUE":GOSUB400:PRIN
T@B,"BLAU";:GOSUB400:PRINT@C,"BL
EU":GOSUB400:PRINT@D,"BLAUW";:GO
SUB400:PRINT@E,"AZUL":GOSUB400:P
RINT@F,"BLA";:GOSUB400:PRINT@G,"
AZZURO":EXEC44539:GOSUB305:RETUR
N
315 PRINT@A,"BLACK":GOSUB400:PRI
NT@B,"SCHWARZ";:GOSUB400:PRINT@C
,"NOIR":GOSUB400:PRINT@D,"ZWART"
;:GOSUB400:PRINT@E,"NEGRO":GOSUB
400:PRINT@F,"SVART";:GOSUB400:PR
INT@G,"NERO":GOSUB500
320 PRINT@A,"WHITE":GOSUB400:PRI
NT@B,"WEISS";:GOSUB400:PRINT@C,"
BLANC":GOSUB400:PRINT@D,"WIT";:G
OSUB400:PRINT@E,"BLANCO":GOSUB40
0:PRINT@F,"VIT";:GOSUB400:PRINT@
G,"BIANCO":GOSUB500
325 PRINT@A,"YELLOW":GOSUB400:PR
INT@B,"GELB";:GOSUB400:PRINT@C,"
JAUNE":GOSUB400:PRINT@D,"GEEL";:
GOSUB400:PRINT@E,"AMARILLO":GOSU
B400:PRINT@F,"GUL";:PRINT@G,"GIA
LLO":GOSUB500
330 PRINT@A,"GREEN":GOSUB400:PRI
NT@B,"GRUEN";:GOSUB400:PRINT@C,"
VERT":GOSUB400:PRINT@D,"GROEN";:
GOSUB400:PRINT@E,"VERDE":GOSUB40
0:PRINT@F,"GRON";:GOSUB400:PRINT
@G,"VERDE":EXEC44539
399 GOTO399
400 FORZ=1TO200:NEXT:SOUND100,2:
RETURN
500 EXEC44539:GOSUB305:RETURN

```

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# CoCo Takes the Plunge: Pool Maintenance Made Easy

By Stephen Snider

**S**wimming Pool Maintenance is a program to give the new pool owner a helping hand in maintaining proper pool conditions. Although new owners will get the most benefit from this program, experienced owners can also find useful information.

The program is menu driven and user friendly. It runs on a 16K Extended BASIC computer. On initialization, the menu gives several choices:

1) Calculate Pool Size in Gallons — This information is needed in the next section. It calculates the size of either rectangular, oval or circular pools.

2) Adjust Chlorine Level — This section asks for the pool size in gallons, air temperature, water temperature and chlorine test results. It then determines the proper amount of chlorine to be added to bring it up to the desired level. It calculates the proper level for either stabilized or non-stabilized pools.

The calculations are taken from manufacturer's specifications. It may be necessary to adjust the results to individual circumstances discovered by

daily testing. If the test results are high from day to day, then less chlorine needs to be added. Once a regular pattern has been established, this section will probably not be needed.

3) Adjust PH Level — This section asks for the results of the PH test. It then gives the chemicals needed (if any) to obtain the proper level.

4) Winterize Pool — This section is a data section only. It gives instructions to properly winterize the pool. It also gives additional suggestions on optional equipment to help minimize problems during the winter.

5) Open Pool — This is also a data section. It gives the proper procedure to open the pool at the beginning of swimming season.

6) Pool Problems — This section presents a menu of various pool problems that you might encounter. It lists the probable cause and one or more solutions.

I think pool owners of all kinds will find this program very useful. If you require any assistance, please contact me at P.O. Box 234, Energy, IL 62933. Please enclose an SASE. □



### Main Menu

\* \* \* MENU \* \* \*

- 1) CALCULATE POOL SIZE (GALLONS)
  - 2) CALCULATE CHLORINE LEVEL
  - 3) CALCULATE PH LEVEL
  - 4) TO WINTERIZE POOL
  - 5) OPEN POOL (BEGIN SEASON)
  - 6) TO TROUBLE SHOOT
- INPUT # DESIRED  
? 6

### Trouble-shooting Menu

\* \* \* MENU \* \* \*

- 1) SLIPPERY POOL WALLS & FLOOR
- 2) GREEN POOL WATER
- 3) EYES BURN AFTER SWIMMING
- 4) BROWN POOL WATER
- 5) CLOUDY POOL WATER
- 6) UNPLEASANT SMELL FROM WATER
- 7) BROWNISH STAINS ON POOL
- 8) FOAMING
- 9) SCALE ON POOL SURFACES

### Sample Run

NUMBER OF PROBLEM? 3  
EYES BURN AFTER SWIMMING

\* \* \* \* \* CAUSE \* \* \* \* \*

HIGH PH OR TOO MUCH CHLORINE

\* \* \* \* \* SOLUTION \* \* \* \* \*

CHECK PH AND CHLORINE CONTENT  
WITH TEST KIT. IF THERE IS TOO  
MUCH CHLORINE, STOP CHLORINE  
DOSAGE AND CHECK CHLORINE DAILY  
UNTIL PROPER LEVEL IS REACHED

190	.....177	1330	.....104
410	.....10	1490	.....196
590	.....130	1630	.....37
790	.....96	1730	.....242
980	.....129	1890	.....25
1070	.....253	END	.....205
1170	.....225		

The Listing: SWIMPOOL

10 \*\*\*\*\*  
20 '\* POOL MAINTENANCE \*

```

30 '* BY *
40 '* STEPHEN M. SNIDER *
50 '* P. O. BOX 234 *
60 '* ENERGY, IL. 62933 *
65 '*****
70 PMODE 1,1
80 PCLS
90 SCREEN 1,0
100 DRAW"BM20,180U50R150D50L150R
150U20L30U5R30D25L80U50
110 PAINT (60,170),3,4
120 PAINT (100,170),3,4
130 DRAW"BM4,190U75R190D75L190
140 PAINT (25,189),2,4
150 DRAW"BM20,40U20R10D10L10BR20
U10D20R10U20L10R10BR10D20R10U20L
10R10BR10D20R10
160 DRAW" BM20,68U20 F5E3D20BR10
U20R10D10L10R10D10BR10R10L5U20L5
R10BR10D20U20F10D10U20BR10R10L5D
20BR15U20R10L10D10R5L5D10R10BR10
U20F10U10D20BR10U20R10D10L10R10D
10BR10U20F10U10D20BR10R10L10U20R
10BR10R10L10D10R5L5D10R10
170 FOR I=1 TO 5000:NEXT
180 CLS
190 CLS:PRINT @ 4,"* * * MENU *
* *"
200 PRINT"1) CALCULATE POOL SIZE
(GALLONS)"
210 PRINT"2) CALCULATE CHLORINE
LEVEL"
220 PRINT"3) CALCULATE PH LEVEL"
230 PRINT"4) TO WINTERIZE POOL"
240 PRINT"5) OPEN POOL (BEGIN SEA
SON)"
250 PRINT"6) TO TROUBLE SHOOT"
260 PRINT"INPUT # DESIRED"
270 INPUT Q: ON Q GOTO 280, 550,
910, 970, 1150, 1260
280 CLS
290 INPUT"POOL IS RECTANGULAR (R
), CIRCULAR (C) OR OVAL (
O)";P$
300 IF P$="R" GOTO 330
310 IF P$="C" GOTO 400
320 IF P$="O" GOTO 460
330 INPUT"POOL LENGTH IS";L
340 INPUT"POOL WIDTH IS";W
350 INPUT"AVERAGE DEPTH IS";D
360 G=L*W*D*7.5
370 PRINT"YOUR POOL HOLDS ";G;"
GALLONS"
380 FOR I = 1 TO 3000 : NEXT
390 GOTO 190
400 INPUT"POOL DIAMETER IS";W
410 INPUT"AVERAGE DEPTH IS";D

```



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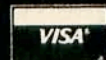
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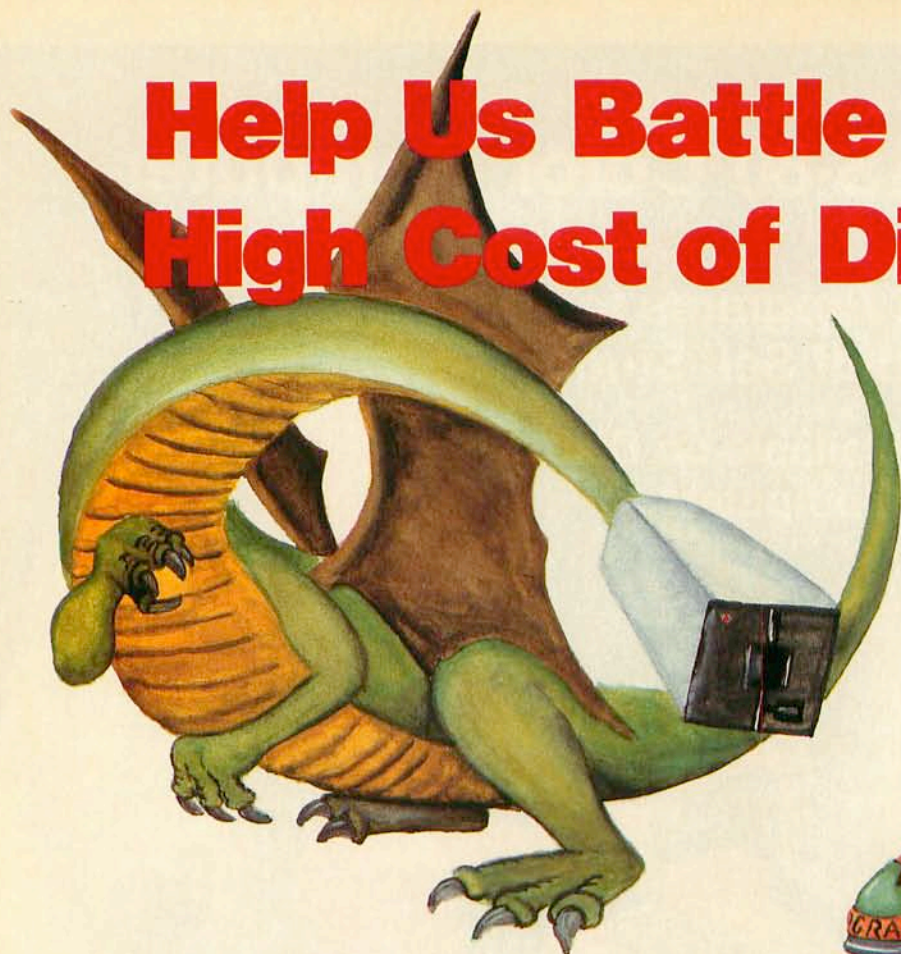
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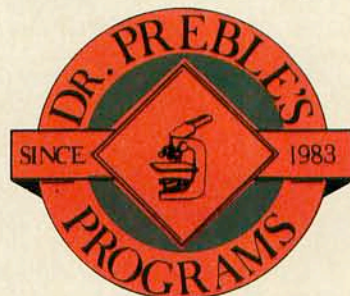
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```

420 G=W*W*D*5.9
430 PRINT"YOUR POOL HOLDS";G;"GA
LLONS"
440 FOR I=1 TO 3000:NEXT
450 GOTO 190
460 INPUT"POOL LENGTH IS";L
470 INPUT"POOL WIDTH IS";W
480 INPUT"AVERAGE DEPTH IS";D
490 G=L*W*D*5.9
500 PRINT"YOUR POOL HOLDS";G;"GA
LLONS"
510 FOR I= 1TO3000:NEXT
520 GOTO 190
530 REM THE CALCULATIONS IN THIS
SECTION ARE FROM CHLORINE MANUF
ACTURERS SPECS.
540 REM THEY MAY NEED TO BE ADJU
STED TO INDIVIDUAL CIRCUMSTANCES
550 CLS:PRINT"* * * ADJUST CHLOR
INE * * *"
560 INPUT"IS YOUR POOL PROPERLY
STABILIZED AND ARE YOU USING STAB
ILIZED CHLORINE";S$
570 IF S$="NO" OR S$="N" GOTO 74
0
580 INPUT"AMOUNT OF WATER IN POO
L (GALLONS)";GA
590 CL=GA/10000*2.5
600 INPUT"AIR TEMPERATURE";A
610 INPUT"WATER TEMPERATURE";WA
620 INPUT"CHLORINE TEST RESULTS"
;RE
630 IF RE <1 THEN GOTO 690
640 IF RE>=1 AND RE<1.5 THEN CLS
:PRINT"CHLORINE LEVEL CORRECT"
650 IF RE>1.5 THEN CLS:PRINT"CHL
ORINE LEVEL TOO HIGH"
660 PRINT"DISCONTINUE CHLORINE M
AINTENANCE AND CHECK LEVEL DAILY
UNTIL CHLORINE REACHES PROPE
R LEVEL"
670 FOR I=1 TO 3000:NEXT
680 GOTO 190
690 IF A>=100 OR WA>=85 THEN CL=
CL+1
700 CLS
710 PRINT"YOU NEED TO ADD";CL;"O
ZS. OF STABILIZED CHLORINE TO YO
UR POOL."
720 FOR I = 1 TO 3000:NEXT
730 GOTO 190
740 CLS:INPUT"AMOUNT OF WATER IN
POOL";W
750 INPUT"AIR TEMPERATURE";AI
760 INPUT"WATER TEMPERATURE";WT
770 INPUT"CHLORINE TEST RESULTS"
;CH
780 IF CH<1 THEN GOTO 850:NEXT

```

```

790 IF CH>=1 AND CH<1.5 THEN CLS
:PRINT"CHLORINE LEVEL CORRECT"
800 FOR I = 1 TO 3000:NEXT
810 GOTO 190
820 IF CH>1.5 THEN CLS:PRINT"CHL
ORINE LEVEL TOO HIGH"
830 FOR I = 1 TO 3000:NEXT
840 GOTO 190
850 CL=W/5000*3.5
860 IF AI>100 THEN CL=CL+1
870 IF WT>85 THEN CL=CL+1
880 CLS:PRINT"YOU NEED TO ADD";C
L;"OZS. OF CHLORINE TO YOU
R POOL"
890 FOR I = 1 TO 5000:NEXT
900 GOTO 190
910 CLS:INPUT"PH TEST RESULTS:";
PH
920 IF PH<7.2 THEN CLS:PRINT"ADD
ONE POUND OF SODA ASH AND CHE
CK AGAIN 4 HOURS LATER."
930 IF PH>=7.2 AND PH<7.8 THEN C
LS:PRINT"PH LEVEL CORRECT"
940 IF PH >7.8 THEN CLS:PRINT"AD
D ONE POUND OF ACID AND CHECK AG
AIN 4 HOURS LATER"
950 FOR I = 1 TO 4000:NEXT
960 GOTO 190
970 CLS:PRINT@33,"* * * WINTERIZ
E POOL * * *"
980 PRINT:PRINT"1) EXAMINE ENTIR
E METAL FRAMEWORK CAREFU
LLY. ANY SIGNS OF RUST SHOULD B
E SANDED AND RE-PAINTED. COAT
ALL METAL SURFACES WITH WA
X."
990 PRINT:PRINT"2) CHECK FOR LEA
KS. A POOL EXPOSED TO FREEZ
ING TEMPERATURES MUST NOT LEAK."
1000 PRINT:INPUT"TO CONTINUE HIT
<ENTER>";E$
1010 CLS:PRINT@33,"* * * WINTERI
ZE POOL * * *"
1020 PRINT:PRINT"3) REMOVE ALL A
CCESSORIES, PIPESETC. THE SKIMME
R AND OTHER THRU THE WALL FIXTUR
ES MAY REMAIN IF KEPT EMPTY."
1030 PRINT:PRINT"4) DROP LEVEL O
F WATER WELL BELOW SKIMMER O
PENING OR ANY OTHER THRU THE
WALL FIXTURES."
1040 PRINT:INPUT"TO CONTINUE HIT
<ENTER>";E$
1050 CLS:PRINT@33, "* * * WINTER
IZE POOL * * *"
1060 PRINT:PRINT"5) TREAT POOL W
ITH ALGAECIDE AND SUPERCHLORINATE
. ADD CHEMICALS ACCORDING TO MA

```



# NUFACTURERS SPECIFICATIONS.

```

"
1070 PRINT:PRINT"6) DO NOT DISTURB POOL AFTER FREEZING. DISTURBING WATER IN POOL AFTER FREEZING COULD RESULT IN MAJOR DAMAGE TO SEAMS AND JOINTS."
1080 PRINT:INPUT"TO CONTINUE HIT <ENTER>";E$
1090 CLS:PRINT@33,"* * * WINTERIZE POOL * * *"
1100 PRINT:PRINT"OPTIONAL ACCESSORIES:"
1110 PRINT:PRINT"1) POOL COVER TO KEEP OUT LEAVES AND OTHER DEBRIS. DO NOT DISTURB IT AFTER IT BECOMES FROZEN IN ICE."
1120 PRINT:PRINT"2) AIR PILLOWS. ..INSTALLED UNDERCOVER TO RAISE FOR DRAINAGE."
1130 PRINT:INPUT"TO CONTINUE HIT <ENTER>";E$
1140 GOTO 190
1150 CLS:PRINT@33,"* * * OPEN POOL * * *"
1160 PRINT:PRINT"1) FILL POOL WITH WATER UP TO MIDDLE OF SKIMMER OPENING."
1170 PRINT:PRINT"2) CHECK PUMP, FILTER AND CIRCULATORY SYSTEM FOR PROPER OPERATION."
1180 PRINT:PRINT"3) ADJUST PH LEVEL."
1190 PRINT:INPUT"HIT <ENTER> TO CONTINUE.";E$
1200 CLS:PRINT@33,"* * * OPEN POOL * * *"
1210 PRINT:PRINT"4) ADJUST TOTAL ALKALINITY. CONSULT PROFESSIONAL."
1220 PRINT:PRINT"5) SUPERCHLORINATE WITH 5-10 TIMES NORMAL REQUIRED CHLORINE."
1230 PRINT:PRINT"6) STABILIZE. ALTHOUGH NOT REQUIRED, IT IS BEST TO STABILIZE YOUR POOL TO ALLOW YOUR CHLORINE TO WORK BETTER."
1240 PRINT:INPUT"HIT <ENTER> TO CONTINUE";E$
1250 GOTO 190
1260 CLS:PRINT@33,"* * * MENU * * *"
1270 PRINT:PRINT"1) SLIPPERY POOL WALLS & FLOOR"
1280 PRINT"2) GREEN POOL WATER"
1290 PRINT"3) EYES BURN AFTER SWIMMING"
1300 PRINT"4) BROWN POOL WATER"

```

```

1310 PRINT"5) CLOUDY POOL WATER"
1320 PRINT"6) UNPLEASANT SMELL FROM WATER"
1330 PRINT"7) BROWNISH STAINS ON POOL"
1340 PRINT"8) FOAMING"
1350 PRINT"9) SCALE ON POOL SURFACES"
1360 PRINT:INPUT"NUMBER OF PROBLEM";N
1370 ON N GOTO 1380, 1450, 1520, 1590, 1660, 1730, 1800, 1870, 1940
1380 CLS:PRINT"SLIPPERY POOL WALLS AND FLOOR"
1390 PRINT:PRINT"* * * * * CAUSE * * * * *"
1400 PRINT:PRINT"ALGAE PRESENT IN POOL WATER"
1410 PRINT:PRINT"* * * * * SOLUTION * * * * *"
1420 PRINT:PRINT"USE ALGAECIDE ACCORDING TO MANUFACTURERS DIRECTIONS"
1430 FOR I=1 TO 10000: NEXT
1440 GOTO 190
1450 CLS:PRINT"GREEN POOL WATER"
1460 PRINT:PRINT"* * * * * CAUSE * * * * *"
1470 PRINT:PRINT"USUALLY A RESULT OF ABNORMAL ALGAE GROWTH"
1480 PRINT:PRINT"* * * * * SOLUTION * * * * *"
1490 PRINT:PRINT"ADD 4 TIMES REGULAR AMOUNT OF ALGAECIDE AND SUPERCHLORINATE. TURN ON FILTER. IF NOT SUCCESSFUL, REPEAT DOSAGE. BACKWASH FILTER IMMEDIATELY."
1500 FOR I = 1 TO 10000: NEXT
1510 GOTO 190
1520 CLS:PRINT"EYES BURN AFTER SWIMMING"
1530 PRINT:PRINT"* * * * * CAUSE * * * * *"
1540 PRINT:PRINT"HIGH PH OR TOO MUCH CHLORINE"
1550 PRINT:PRINT"* * * * * SOLUTION * * * * *"
1560 PRINT:PRINT"CHECK PH AND CHLORINE CONTENT WITH TEST KIT. IF THERE IS TOO MUCH CHLORINE, STOP CHLORINE DOSAGE AND CHECK CHLORINE DAILY UNTIL PROPER LEVEL IS REACHED"
1570 FOR I = 1 TO 10000: NEXT
1580 GOTO 190
1590 CLS:PRINT"BROWN POOL WATER"
1600 PRINT:PRINT"* * * * * CAUSE

```



```

* * * * *
1610 PRINT:PRINT"TO MUCH MINERAL
CONTENT IN WATEROR DEAD ALGAE"
1620 PRINT:PRINT"* * * * * SOLUT
ION * * * * *"
1630 PRINT:PRINT"HAVE WATER PROF
ESSIONALLY ANALYZED. IF PR
OBLEM STEMS FROM DEAD ALGAE, CON
TINUOUS OPERATIONOF FILTER IS NE
CESSARY. BACKWASHFILTER IMMEDIAT
ELY"
1640 FOR I = 1 TO 12000: NEXT
1650 GOTO 190
1660 CLS:PRINT"CLOUDY POOL WATER
"
1670 PRINT:PRINT"* * * * * CAUSE
* * * * *"
1680 PRINT:PRINT"IMPROPER PH BAL
ANCE, HARD WATER, INSUFFICIENT CH
LORINE CONTENT OR FOREIGN MATTER
IN WATER"
1690 PRINT:PRINT"* * * * * SOLUT
ION * * * * *"
1700 PRINT:PRINT"CHECK PH WITH T
EST KIT AND ADJUST AS NEEDED.
CONSULT PROFESSIONAL ON
HARD WATER. TEST CHLORINE CONTE
NT WITH TEST KIT AND ADJUST AS N
EEDED. IF FOREIGN MATTER IS PRESE
NT, CHECK FILTER AND CLEAN IF NE
CESSARY.
1710 FOR I = 1 TO 15000: NEXT
1720 GOTO 190
1730 CLS:PRINT"UNPLEASANT SMELL
FROM WATER"
1740 PRINT:PRINT"* * * * * CAUSE
* * * * *"
1750 PRINT:PRINT"PROBABLY A LACK
OF CHLORINE CONTENT"
1760 PRINT:PRINT"* * * * * SOLUT
ION * * * * *"
1770 PRINT:PRINT"TEST FOR PROPER
CHLORINE CONTENT AND ADJUST AS N
EEDED. IF CHLORINE TESTS
OK, SUPERCHLORIN-ATE."
1780 FOR I = 1 TO 10000: NEXT
1790 GOTO 190
1800 CLS:PRINT"BROWNISH STAINS O
N POOL"
1810 PRINT:PRINT"* * * * * CAUSE
* * * * *"
1820 PRINT:PRINT"CORROSION OF ME
TAL PARTS DUE TO LOW PH. HIGH AL
KALINITY. DISSOLVED METALS"
1830 PRINT:PRINT"* * * * * SOLUT
ION * * * * *"
1840 PRINT:PRINT"CHECK AND ADJUS
T PH. CHECK AND ADJUST ALKALINIT
Y. CHECK WITH DEALER ABOUT DISSO

```

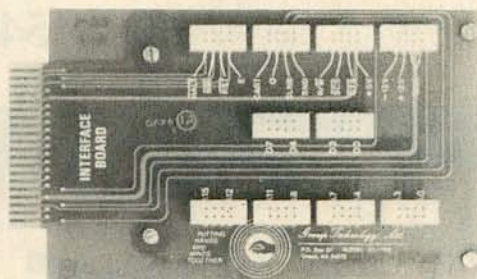
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LVED METALS."
1850 FOR I = 1 TO 10000: NEXT
1860 GOTO 190
1870 CLS:PRINT"FOAMING"
1880 PRINT:PRINT"* * * * * CAUSE
* * * * *"
1890 PRINT:PRINT"TOO HIGH A CONC
ENTRATION OF ALGAECIDE"
1900 PRINT:PRINT"* * * * * SOLUT
ION * * * * *"
1910 PRINT:PRINT"READ PRODUCT LA
BELS CAREFULLY. TOO MUCH ALGAECI
DE DOES NOT HARM POOL OR SWIMMER
S"
1920 FOR I = 1 TO 10000: NEXT
1930 GOTO 190
1940 CLS:PRINT"SCALE ON POOL SUR
FACES"
1950 PRINT:PRINT"* * * * * CAUSE
* * * * *"
1960 PRINT:PRINT"EXCESSIVELY HAR
D WATER"
1970 PRINT:PRINT"* * * * * SOLUT
ION * * * * *"
1980 PRINT:PRINT"ADJUST ALKALINI
TY"
1990 FOR I = 1 TO 5000: NEXT
2000 GOTO 190

```

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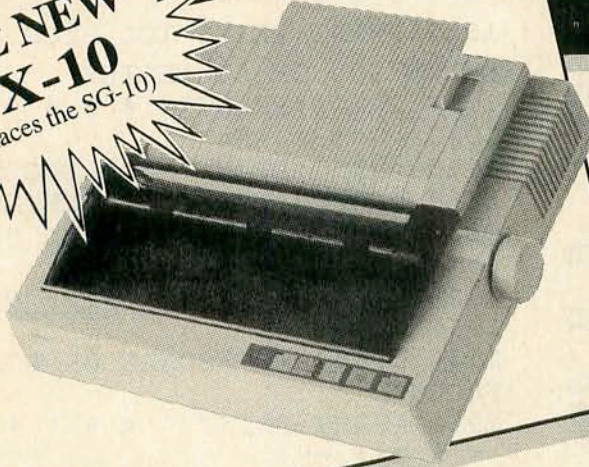
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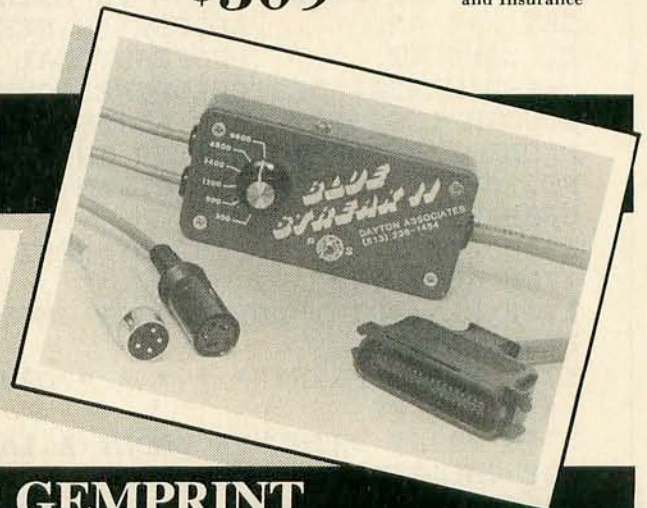
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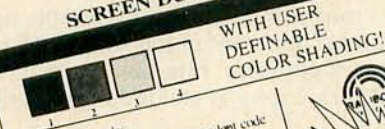
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# RECEIVED & CERTIFIED

The following products have recently been received by THE RAINBOW, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

**Car Dealer Assistant**, a financial utility program designed to provide car dealers with an efficient way to figure four "what if" computations for use in negotiating, insurance calculations, rolling of all amortization variables, conversion of annual add-on rate to A.R.P. and two utility programs to change applicable tax rates and/or erase accounts from the disk. *Sylvester Software, 6943 Oleander Avenue, Highland, CA 92346, disks and manual \$195*

**Digital Memory Oscilloscope**, a hardware/software kit requiring a 64K CoCo 2 with Level II RAM to convert a CoCo TV display into an oscilloscope screen for audio range signals and lower. Auto-trigger and storage in 8K buffer allows detailed study of AC and slowly changing DC signals. *D & A Research, 400 Wilson Avenue, Satellite Beach, FL 32937, unit includes all necessary hardware and software, \$169*

**Plateau of the Past**, a 32K graphics Adventure game requiring a disk drive. The scenario places you in the role of explorer accepting the quest for a tycoon's foolhardy brother, lost in a treacherous and unexplored region of the globe. To find and rescue him, you must overcome the hostilities of nature, natives and prehistoric creatures. *Zytek Ltd., P.O. Box 701, Blue Island, IL 60406, disk \$26.95 plus \$2 S/H*

**Inside Information**, a book by John Helliwell to give electronic service users a guide to matching online databases to business needs, instruction in database search procedures and a compendium of facts, tips and lists to help maximize return on communication time and money. *New American Library, 1633 Broadway, New York, NY 10019, \$19.95*

**Casper CoCo Quick Assembler**, a 32K programming utility requiring a disk drive that combines the editor, assembler and debugger into one whole. The editor, by looking up symbols and opcodes, saves indexes into tables instead of characters. The debugger is then able to use the assembler to find locations in memory from their position in the editor's source file, which the debugger displays. *Earl W. Casper, 6012 S 14 Pl, Phoenix, AZ 85040, disk \$20*

**Software Spare Parts**, book by Kent Porter consisting of C language routines and utilities covering areas from text processing to matrix algebra, from data conversion to graphics, and including a range of flexible routines that can be plugged into larger programs. *New American Library, 1633 Broadway, New York, NY 10019, \$24.95*

**Darkmoor Hold**, a 64K graphics Adventure requiring a disk drive. The scenario places you and your comrades (a dwarf and an elf) on a perilous exploration of the 10 levels of Darkmoor. Your nemesis is an evil wizard, who will continue to try to thwart your band's every acquisition of treasures with stronger and stronger spells and creepier and wilier monsters. *Prickly-Pear Software, 2640 N. Conestoga Ave., Tucson, AZ 85749, disk \$29.95 plus \$1.50 S/H*

**Eagle**, a 32K graphics Simulation requiring joysticks. The scenario places you in the role of pilot breaking out of lunar orbit and attempting a soft landing. Joysticks control thrust and craft altitude and information is continuously displayed on horizontal and vertical velocities, acceleration values, distances from objectives and fuel consumption. *Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette \$24.95, disk \$29.95 plus \$1 S/H*

**CoCo Valet**, a 32K home-based filing system requiring a disk drive. Features include search, edit, mark fields (for selecting fields for printouts), change files, on-screen help and non-destructive cursor. *Derby City Software, 3025 Kozy Kreek Drive, Louisville, KY 40220, disk \$21 plus \$3 S/H*

**A2D Deluxe Joystick**, a joystick featuring self-centering as well as free floating operation, mechanical trims on both axes and an eight-foot cable. *Cinsoft, 2235 Losantiville Avenue, Cincinnati, OH 45237, \$27.95 each, \$49.95 pair*

**Best of CoCo-Time '85 (Utilities)**, a program comprising 18 often-used utilities, most requiring 16K. Among the utilities are: CoCo Disk Zap, 40K BASIC (requires 64K), Banner Creator, DMP Graphics Dump, In Memory Disk Drive (requires 64K), Function Keys, Disk Mailing List (requires 64K), Tape/Disk Encryption and BASIC Program Packer. *Microcom Software, P.O. Box 214, Fairport, NY 14450, cassette or disk \$26.95 plus \$3 S/H*

**U-Buffer**, a hardware printer buffer designed for user expandability. The U-Buffer is available in 16K (P16) and 64K (P64) versions and comes with a handbook detailing installation, operation, upgrades and technical information. *Digital Devices Corporation, 430 Tenth Street, Suite N205, Atlanta, GA 30318, P16 \$119.95, P64 \$149.95.*

**Adventure In Mythology**, a 64K graphics Adventure that places you in the roles of various heroes of Greek mythology. You can provide Icarus with a better idea, slay the Minotaur in the labyrinth of Crete, discover the secret of the statue of Galatea and win the hand of the beautiful huntress, Atalanta. *Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette \$24.95, disk \$27.95 plus \$1 S/H*

**Pumpman**, a 32K ML arcade game requiring a joystick. The objective is to destroy the aliens by firing the pump and pumping them into oblivion. Perils include the misuse of your pump resulting in its disappearance, the aliens have only to touch you to kill you and the aliens change form and tactics at ran-



dom. *Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette \$24.95, disk \$27.95 plus \$1 S/H*

**CoCo Base I**, a 32K relational database manager requiring a disk drive and featuring 10 programs. Possible are up to 600 records of up to 1,000 characters, moving specific data around within the program to allow files to update each other, string and numeric operators to allow any user-definable comparison or calculation and compatibility with all CoCo printers. *JTJ Enterprises, P.O. Box 110841, Nashville, TN 37211, disk \$49.95 plus \$2 S/H*

**Temple of the Lost Ark**, a 32K Adventure game for the intermediate Adventurer. Features include a help key for guidance through the hazards and pitfalls and a command interpreter that requires only one-word commands. *The Saint John Gallery, P.O. Box 613, Mount Sinai, NY 11766, cassette \$7, disk \$8*

**Hall of the King II: The Inner Chamber**, a 64K graphics Adventure on two disks requiring a disk drive but not *Hall of the King I* for play. This game begins another quest for the legendary Earthstone, the foundation of an ancient dwarven civilization. Only by daring the hazards of the inner chambers can you hope to find and learn to use the Earthstone. *Prickly-Pear Software, 2640 N. Conestoga Avenue, Tucson, AZ 85749, disks \$39.95 plus \$1.50 S/H*

**Uninterrupted Power Source (UPS)**, a hardware accessory to prevent loss of data from power failures for all computers using 5V memories. It consists of a 2.6AH sealed battery, a control circuit, a miniature toggle switch and a light emitting diode. Three connections are necessary: 5 volts, ground and unregulated 9-12 volts. Supplies power to the memories for as long as two hours when commercial power sources fail. *Dynamic Electronics, Inc. P.O. Box 896, Hartselle, AL 35640, \$59.95*

**Unkill**, a 32K disk utility requiring two disk drives, a printer and knowledge of the printer's compressed mode. It is menu driven and does not require knowledge of files and fat tables in order to recover files from a bad disk to a blank one. *Proper Programs, P.O. Box 681, Garner, NC 27529, disk \$9.95 plus \$2 S/H*

**1986 Tax Estimate**, a 32K home financial utility requiring a disk drive. Possible is the estimation of federal tax liability based on the laws in effect at the time of publication. *TRY-O-BYTE, 1008 Alton Circle, Florence, SC 29501, disk \$5*

**GOTHELLO**, a 16/32/64K strategic board game for one or two players with three levels of difficulty. *Bangert Software, P.O. Box 21056, Indianapolis, IN 46221, cassette or disk \$12.95*

**Graphic Echo**, a 16/32K graphics screen dump program designed for Radio Shack dot-matrix printers. Sold on cassette, it is compatible with disk systems and offers regular or enlarged images, positive or negative images, with manually set margins or auto-centering, and capable of working in all five PMODEs. *Tothian Software, Box 663, Rimersburg, PA 16248, cassette \$14.95*

**Vegas Game Pak**, a 32K arcade game requiring a joystick and containing the following casino favorites: Regular fruit-type slot machine, Bar-bar five-seven-blank slot machine, Multiline pay fruit-type slot machine, Video poker, Video keno and Video blackjack. *Novasoft, 4285 Bradford N.E., Grand Rapids, MI 49506, cassette \$24.95, disk \$27.95 plus \$2 S/H*

**CoCo DISKZAP Utility**, a disk editor featuring the following commands and functions: Mode, to allow users to specify the disk's sector offset; Zero, allows setting any sector in the disk to Hex 00; Copy; Print; Verify; Format; Display; File Zap, to allow stepping through a file (ML, BASIC or ASCII) to modify any part; and Directory. *Super-*

*Com Associates, 449 Rougemount Drive, Pickering, Ontario, Canada L1W 2B8, manual and disks \$39.95 U.S. funds.*

**LFAST**, Linear-Free-Access-Source-Translation, an assembly utility requiring a disk drive. Possible are the linking of ML programs, insertion of text messages in the object code stream and the ability to point to buffers where text arrays, numeric arrays and ML subroutines are located. *D.J. Leffler, 955 Trinidad Road, Cocoa Beach, FL 32931, \$68.50*

**KAMELION**, an interface operating system (IOS) using the Supercomp 68008 expansion board (produced by Cir-Pac Ltd.). This IOS provides complete co-processing, access and control between a CoCo and the Motorola 68008 microprocessor on the expansion board. CoCo's capabilities are expanded to almost equal the Radio Shack Model 16. Included is the capability to write standard CoCo disk files from the 68008 memory up to full disk capacity for a single file. Also included are complex commands such as CONFIGURE, which can be invoked to configure the 68008 memory with data and machine code files. *D.J. Leffler, 955 Trinidad Road, Cocoa Beach, FL 32931, \$78.50*

**Code Practice**, a 32K instructional aid to help those who would like to learn or improve their skills with International Morse Code. Menu driven, the operator may select listening to random letters, numbers and punctuation or code conversation between Ham Radio operators. Speed at which code is sent can be selected by the operator between two and 90 words a minute. *Sunrise Software, 8901 NW 26 Street, Sunrise, FL 33322, disk \$9.95*

The Seal of Certification program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a Seal, the magazine certifies the product does exist — that we have examined it and have a sample copy — but this does not constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW's reviewers for evaluation.

— Monica Dorth



# REVIEWING REVIEWS

## PLANECEO & PGCALPRT

Editor:

We found the review of *PLANECEO* and *PGCALPRT* by John McCormick [April 1986, Page 190] to be just and considerate. In reply, we have a few comments to make about the programs and the review.

*PLANECEO* is designed to be strong in educational content and is intended for student use or for refresher use by non-students. If used by students, it should be considered supplemental to, and not substitutive for, formal scholastic training. *PGCALPRT* anticipated more use by professionals. Both programs are for serious use.

We regret the reviewer found bugs. We wish we could guarantee there will be no more but there may be some bugs left in spite of the authors' attempts to eliminate them. We will keep users informed of bugs and fixes. The ones reported in the review have, of course, been corrected.

*PGCALPRT* is written to send every geometric calculation to the printer. The reviewer pointed out that some systems result in no such optional printing. As a result of his valid suggestion, current releases of *PGCALPRT* contain patches that will enable users to either retain the original concept or to change the main and subprograms to provide optional printing. Also, the patches will be supplied in printed form to prior users.

The *CONVERT* subprograms were included in both programs as sort of a bonus. They were not intended to print on the printer.

Thank you for the review and thanks to John McCormick for his work.

George F. Saunderson  
TASC

## PIXGEN

Editor:

I would like to comment on the review by Eric Tilenius of *PIXGEN* (RAINBOW, February 1986, Page 208).

I feel that Mr. Tilenius did a fair and accurate review of *PIXGEN* utility, but would like to point out some things he may not have been aware of. Mr. Tilenius mentions in his review that he discovered two places in the program where error handling bugs could be found.

The first of these, which occurred when drawing a line, has been fixed.

The second bug occurred during a "paint" operation. The documentation of *PIXGEN* emphasizes several times that the painting utilities must be used carefully. The reason is that the speed achieved by the *PIXGEN*'s painting routines is accomplished by mathematical algorithms that have few internal error handling routines.

The review states that *PIXGEN* could interest anyone wishing to create graphics Adventures where storing pictures on disk is not a valid option. I disagree. *PIXGEN* makes it possible to store several times as many pictures as could be stored on an entire disk in only about 12K of RAM. With the exception of these items, I feel Eric Tilenius did a remarkable job.

Scott A. Cabit  
Author of *PIXGEN*

## Track Events

Editor:

We appreciate the review of *Track Events*, Page 200 of the February 1986 RAINBOW. However, it wasn't mentioned that the game requires 64K, and our updated version of the game requires a joystick. We would also appreciate it if you would inform readers of our new address: 3937 Shady Hill, Dallas, TX 75229.

Baron Products  
Dallas, TX

## Magazine Index System Disk Pilot

Editor:

Thanks to your reviewers Dan Smith and Larry Goldwasser for their careful reviews of *Magazine Index System* and *Disk Pilot* (December 1985, pages 224 and 233).

Since *Magazine Index System* was submitted for review, a new, updated version has been released (version 1.1). This release corrects minor problems with the original and adds some new features. Files no longer need to be on Drive 0 — any drive on the system can now be accessed by *Magazine Index System*. In addition, the search routines have been rewritten and are now faster than before. The user is no longer limited to nine search terms, nor is the 29 character limit imposed.

Regarding *Disk Pilot*, I'd like to apologize to Mr. Goldwasser. Apparently an addendum sheet was missing from the package he received — this sheet explains the 'S' option, which permits the user to access any of his drives (0 through 3).

Thanks once again for an excellent magazine — keep up the good work, everyone in the CoCo Community appreciates it.

Bob van der Poel  
CMD Micro Computer Services Ltd.

## CoCo Max II

Editor:

Thank you for the fine review of *CoCo Max II*. We would like to correct, however, a statement that was inaccurate.

Mr. Jackson writes that "*CoCo Max* has no provisions for killing or renaming files." This is not the case. You can leave *CoCo Max* at any time with the "Quit" function, then Kill or Rename any file(s). When finished, simply type RUN. The *CoCo Max* screen will come back exactly where you left off, and you don't lose your art work. We think this ability to switch between *CoCo Max* and BASIC at will is much more powerful than a simple Kill and Rename feature would be.

John Monin  
Colorware Inc.

We welcome letters to "Reviewing Reviews" and remind you that they may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type SEND and address to: EDITORS.





# WAR GAMES



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Prices on all programs include shipping to U.S., APO's, Canada. COD's (USA only) add 10%. Florida Residents add 5%. For disk version add \$2. All Orders shipped within 24 hours. Programs require Color Computer TM (Tandy Corp.) or TDP System 100 Computer TM (RCA). Many programs soon to be available on MS-DOS systems.

**P. O. Box 14806**  
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## 'Shooting Gallery' Math Mission Reinforces Skills

Condition red! Prepare for imminent invasion. Protect yourself with intelligence and skill and future generations will honor your courage and knowledge.

*Math Mission* is an educational game designed to reinforce math skills in addition, subtraction, multiplication and division. It has four levels of difficulty ranging from basic facts to problems with two digits. The program is suitable for first- to fourth-grade students. There is an option that combines all difficulty levels. The game is similar to a shooting gallery and is played with joysticks. Problems are shown with six answers. There is a timer so students must answer the problem promptly, but it is not so fast that it discourages slower students.

It is easy to load and run. If using a disk drive, you are entitled to make two backup copies. With the cassette version, there is an explanation of how to transfer the program to disk.

When running *Math Mission*, you see a title screen and then the main menu. Choose addition, subtraction, multiplication, division and the level of difficulty ranging from basic facts to two digit problems. The game then starts the first of four rounds of play. In each round the student receives 10 problems. The Shot Timer and Power Level Bars with their numerical readouts are in the lower right-hand

corner of the screen. When play begins, these are set to the maximum.

The problem is shown at the bottom of the screen with six possible answers at the top. Using the joystick, students move the "gun" under the correct answer and fire. If right, they move on to the next problem and the number of correct responses is shown in the lower left-hand corner. If wrong, the power bar is lowered by 25 percent but they get another chance to answer the problem correctly. If they are correct the second time, the power bar is reset and a right answer is recorded. If wrong again, the correct answer is shown, but a wrong answer is recorded, the power is reduced by 25 percent and they get the next problem.

If four problems are missed in any level, a sad face is displayed and they are told to press the firebutton which returns them to the main menu. A perfect score in any round generates a short song and graphics display. After all four rounds, students receive one of two graphics screens and a musical tune. If they score 100 percent in all four rounds, there is a graphics display showing that they are a "Grand Master of *Math Mission*." For any other score they are shown a screen saying they are a "Master of *Math Mission*."

One distraction though; in the second through fourth rounds, instead of having the graphics on a black screen, they were on a green screen. This made reading some of the numbers hard because I could not see the vertical extension in numbers such as four.

This program would be interesting for elementary students to use. There is plenty of sound, movement and action. I also like how students are given a second chance before getting an answer wrong. When I played, there were times that I knew the right answer, but didn't get the joystick in the right place or pressed the firebutton too fast and it was nice not to be punished for a dexterity mistake.

(Sugar Software, 1719 North 50th Avenue, Hollywood, FL 33021, cassette or disk \$24.95 plus \$1.50 S/H)

— Thomas E. Nedreberg

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Hint . . .

## Single Disk COPY

Here's a feature which can be invaluable for users with a single disk drive. The Radio Shack Disk Manual mentions that use of the COPY Command requires two or more drives. This is not necessarily true. A single drive copy can be made by doing the following:

- 1) Insert disk with file to be copied into the Drive 0.
- 2) Type COPY "FILENAME/EXT:0 and press ENTER.
- 3) There will be one short beep and a notice will appear on the screen instructing the user to insert the destination disk.
- 4) Insert destination disk and press ENTER.
- 5) Once completed there will be two copies of the program: one original and one on the destination disk.

This method works for all types of disk files including machine language programs.



## CD Editor Provides Invisible Convenience

Using Extended BASIC's line EDIT function to make changes in a block of program lines can, at times, be frustrating. I usually end up listing all the lines in the section of interest and then noting those needing changes or corrections. Each line is then edited one by one. Until now, there has been no easy way of working on programs one screen at a time. *CD Editor* from C & D Computer Products provides some relief from the frustration of program editing. This utility program provides many of the features of a full-screen editor without using one extra byte of memory in a 64K CoCo.

*CD Editor* requires a 64K CoCo with at least one disk drive and should work on all versions of JDOS or Disk BASIC. The program comes on disk in the form of a short BASIC program that copies the BASIC and Extended BASIC ROMs into the upper 32K of RAM. It then checks for the type of Disk BASIC that is being used and loads in new machine code from disk to the upper RAM locations containing the original line editor. The editor fits in the same amount of space that was taken up by the original EDIT function. If desired, BASIC's standard OK prompt can be changed to anything you want, up to five characters, such as READY. The loader program then clears the screen and erases itself. The copy that I originally received failed to load properly with JDOS BASIC 1.21. A phone call to C & D Computer Products isolated the problem. A short time later I got a new disk that loaded and ran properly with JDOS BASIC 1.21 and Disk BASIC 1.1.

The program is transparent to BASIC and permits BASIC programs to run as if it did not exist. The cursor becomes a blinking black square that turns into a blinking white square when the editor is active. Typing in the command EDIT turns the program on and off.

*CD Editor* works on any displayed portion of a program that has just been typed in or listed. A movable cursor determines where on the screen any changes are being made. Cursor movement is controlled by the four arrow keys. (The JDOS version uses the shifted up- and down-arrows for vertical motion.)

To delete characters, place the cursor on the first character to be deleted and press the shifted left arrow once for each character that is to be deleted. To add characters, place the cursor at the point of insertion, add blank spaces with the shifted right-arrow key, and then type the new data over the blank spaces. Typing at the current cursor position causes the new text to overwrite the existing text.

Visit the  
**Coco Community Center**  
**THE RAINBOW'S CoCo SIG**  
on  
**DELPHI**

None of the changes are actually entered until the cursor is moved to the end of the line being edited and the ENTER key is pressed. Pressing ENTER in the middle of the line causes the last portion of the line to be lost. I had a tendency to forget this and often pressed ENTER immediately after making changes, and not at the end of the line.

The editor also allows two or more program lines to be combined into one. Program lines may also be duplicated by changing the line number of the line that is to be duplicated. I found this last feature quite handy in writing programs that use many lines of nearly identical code. I just duplicated the lines as many times as required and then went back and made the unique changes to each line.

Another program on the disk lets you save the modified BASIC and Extended BASIC into EPROMs to make the screen editor and new prompt a permanent part of the CoCo. I could not try this because I do not own an EPROM programmer. However, I did try the EPROMs loaned to me by C & D Computer Products and had no problems.

The disk comes with a three-page instruction sheet which covers loading and using the program. A copy of the instruction manual is on the disk in the form of a BASIC program. The disk also contains a catalog of other programs from C & D. None of the programs are copy protected so backups can be made. The programs, however, are copyrighted.

(C & D Computer Products, 1706 Seabrook Avenue, Cary, NC 27511, disk \$19.95 plus \$2 S/H)

— Chuck Wozniak

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## Super RAMDisk Provides Mega-memory

"More memory!" they cried. "Give us mega-memory like the competition!" Well, CoCo users, now you have it. Spectrum Projects is distributing a 256/512K memory expansion from DISTO.

To use the DISTO Super RAMDisk you need a 64K CoCo and a Multi-Pak Interface. Why the Multi-Pak? It enables the DISTO upgrade to be used with the CoCo 2, something that has been hindering previous upgrade kits. The unit is housed in an attractive white metal case and plugs into slot number 2 of the Multi-Pak. Software for both Disk BASIC and OS-9 is provided on disks to use the memory upgrade as a RAM disk. With OS-9, up to three RAM disks can be connected at one time.

What is a RAM disk and do I need one? At present, the only software that exists for the Super RAMDisk is drivers that make the memory expansion act as another disk drive. It's not a normal disk drive, though. First, it is super fast. The total time to read or write a sector is less than 5/1,000 of a second. One of the uses could be storage of graphics pages for fast recall during games. Can you write longer programs? Not with the present software. The problem is not with the memory expansion, but with the software. As you are probably aware, Disk BASIC only recognizes 32K of user memory.

To write longer programs, you could split them into small ones, but you can do the same thing with a regular disk drive. You will have to find a way to pass parameters (variables) between programs if necessary. A suggestion is to store them in a file and recall them when necessary. Remember, we are talking about a quiet, fast disk drive that consists of RAM.

The use of a RAM disk with OS-9 is another story. Regarding longer programs, as long as modular programming concepts are used, BASIC09 already has the facility to pass parameters between programs. Considering the disk intensive nature of OS-9, it's a welcome relief to transfer the commands directory to the RAM disk and watch it fly. Commands execute almost instantaneously. No noise either.

There are still memory constraints inherent to OS-9 Level I, but a RAM disk seems to speed up things quite a bit.

Brian Lantz has licensed both the Disk BASIC and OS-9 RAM disk drivers to DISTO. The Disk BASIC version is on a separate disk.

After entering `LOADM"RAMPK":EXEC`, you are prompted for the default RAM disk drive number and Multi-Pak slot number. Then, you are asked whether to clear the RAM disk.

After these prompts, the RAM disk is formatted and available for use as another disk drive. You are in the 64K RAM mode and the driver is located at `$FD00`. This is why you are asked whether to clear the RAM disk. If you have to use the Reset button, the data on the RAM disk is not lost, but you have to re-initialize the driver before it can be recovered.

The DISTO Super RAMDisk OS-9 Driver by Brian Lantz is virtually the same driver software used for other memory expansions. The module is named RAMDisk and,

after loading this module, you must link the driver "R0" to the system. You must then format the RAM disk. The default format is 40 tracks, single-sided, but the device descriptor can be changed to take full advantage of the spare memory.

The only drawback to doing this is backing up the RAM disk. The use of a utility by Computerware named *Dircopy* makes it easier.

The DISTO unit is compatible with all CoCos. Previous units reviewed would not work with the CoCo 2. The cost of using it is the price of a Multi-Pak. The unit is well-constructed and functions as advertised.

I do see some shortcomings with the Disk BASIC software and documentation. I sometimes wonder how to take advantage of all of this extra memory. The only documentation for Disk BASIC is a typewritten page explaining how to boot the driver. No information is given about the hardware aspects of the unit. The user should have the page addresses and a description of the hardware for experimentation purposes.

The OS-9 software documentation is just adequate. It explains all of the initialization steps and procedure files, but again it lacks any information about the hardware. This is not so bad for OS-9, due to the nature of the system, but I'd like to see it.

In comparison to other units I've seen, this unit is adequate from a hardware standpoint, and doesn't require soldering, wiring or opening the computer. We will have to wait and see if any software other than the RAM disk applications develops.

(Spectrum Projects, Inc., P.O. Box 21272, 93-13 86th Drive, Woodhaven, NY 11421, 256K version \$129.95, 512K version \$169.96, distributed in Canada by CRC Computers, 10802 Lajeunesse, Montreal, Quebec, Canada H3L 2E8)

— Dan Downard

### Two-Liner Contest Winner . . .

Type in *Babbler* and RUN it. See if you can make out what the CoCo Man is trying to say. This would make a cute subroutine.

#### The listing:

```
Ø PCLS:PMODE4,1:SCREEN1,1:CIRCLE
(128,96),5Ø:CIRCLE(112,8Ø),1Ø:CI
RCLE(144,8Ø),1Ø:CIRCLE(112,8Ø),5
:CIRCLE(144,8Ø),5:PAINT(1Ø5,8Ø),
5,1:PAINT(137,8Ø),5,1:CIRCLE(128
,96),7:PAINT(129,96),5,1
1 CIRCLE(128,116),1Ø,1:SOUNDRND(
255),RND(1Ø):CIRCLE(128,116),1Ø,
Ø:DRAW"C1;BM118,116R2Ø":FORA=1TO
RND(2ØØ):NEXT:DRAW"CØ;BM118,116R
2Ø":GOTO1
```

Brett Bauer  
South Bend, Indiana

(For this winning two-liner contest entry, the author has been sent copies of both *The Second Rainbow Book of Simulations* and its companion *The Second Rainbow Simulations Tape*.)



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This universal driver works with all monochrome monitors, and is easily installed without clips, jumpers or soldering (except in some later CoCo 2s with soldered-in video chips). Here's crisp, clear, flicker-free monitor output with all the reliability you've come to expect from HJL Products.

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## SemiGraphics Support Utility Unleashes 'Hidden' Abilities

The *SemiGraphics Support Utility*, available for 16K ECB CoCos on either disk or cassette, expands Extended Color BASIC to allow direct access to the semigraphics modes.

What's a semigraphics mode? You can go through Tandy's *Color BASIC*, *Extended Color BASIC*, and *Disk System* manuals and still not know a thing about semigraphics. Why? Because four of these five semigraphics modes are not supported by any version of CoCo BASIC. So how do you find out about them? The *RAINBOW* is a source, and so is William Barden's book, *Color Computer Graphics*.

What you'll find is that these semigraphics modes are built into a chip in the CoCo called a Video Display Generator. One of the modes (SG 4) is accessed by Color BASIC as the Lo-Res graphics through the SET, RESET and POINT commands. The remaining four modes (SG 6, SG 8, SG 12 and SG 24) are called the forgotten modes. When the various versions of CoCo BASIC were developed, these capabilities were, for one reason or another, not supported. Without BASIC support, these modes are cumbersome to use. Various numbers must be POKEd into memory locations to select color, or set or reset the various picture elements. A pain, to say the least.

The advantage of the semigraphics modes over the true graphics modes is that all eight colors can be used on one screen with a fairly fine resolution of 64 by 192. The semigraphics modes also lend themselves to intermixing text and graphics on the same screen.

Are these advantages worth the hassle involved in figuring out all of those POKEs? To the average programmer, probably not. Not, that is, without *SemiGraphics Support Utility*.

*SemiGraphics Support Utility* becomes part of ECB, adding 18 commands and four functions to the programming language. These new commands and functions can be freely intermixed with all of the ones you're already used to. The graphics require allocation of video pages, much like ECB graphics. Various semigraphics modes can be assigned to various sets of pages. Any element (based on X and Y

coordinates) can be set to any color. The *SemiGraphics Support Utility* commands, similar to their ECB counterparts, allow the user to draw lines (solid, dotted or dashed), boxes, circles, ellipses or arcs. Figures thus created can be filled with any color using the command parallel to ECB's PAINT.

The figures can be redrawn at other coordinates, or moved to other parts of the screen or even to other screens not currently displayed. These features should be of interest to anyone creating animation. As the demo program displays, smooth and rapid movement of screen figures can be produced. Figures produced in the highest resolution mode can be "scaled down" to lower resolution modes without altering X/Y coordinates. Video pages can also be copied from one location in RAM to another.

Since the alphanumeric mode is one of those accessible by *SemiGraphics Support Utility*, text and graphics can be mixed on a single screen. In addition to the graphics capabilities, the utility allows the generation of either one-bit or six-bit sounds. The user supplies what is called a "frequency delay" and an "envelope delay" for these sound-producing commands. Neither of these terms is defined in the documentation, so expect to do a little experimenting. The six-bit version allows control of the sound volume. With practice, you can produce some pretty bizarre sounds.

The user is able to print his graphics creations to a dot-matrix printer. I was unable to review this aspect of the utility because the only kinds of printers supported are the Gemini-10X and Epson. Pictures included in the documentation indicate that the various screen colors are represented on the printout by shades or patterns of gray. I would like to see this utility with support for more printers.

The documentation consists of 61 pages. I have already pointed out what I feel to be a shortcoming in documentation for the sound commands. The remainder of the documentation shares this shortcoming: brevity. To give credit where credit is due, however, *SemiGraphics Support Utility* is a very complex system and would not be easy to document. Don't expect to sit down and immediately produce stupendous semigraphics: This system takes some work. I would compare learning it to learning ECB's graphics capabilities. Included in the documentation are short programming examples, illustrating all the features. On the disk (or tape) with the utility is a demo program in which *SemiGraphics Support Utility* struts its stuff. The listing of this demo is provided. I strongly urge the user to type in the example programs, run the demo and go over the listing as a learning experience.

One of the first applications I thought of for this program was the creation of title screens and the like for my programs. Remember though, *SemiGraphics Support Utility* must be in place on the computer running the program, which could cause exportation problems.

Extended Color BASIC is great for graphics. Have you ever found yourself wishing you could use more than four colors? Or have graphics and text on the same screen? Then I would definitely recommend the *SemiGraphics Support Utility*. Check the price — I consider it a bargain few graphics programmers should pass up.

(Micro Computer Systems, 1404 Sunset Dr., Friendswood, TX 77546, cassette \$14.95, disk \$17.95)

— Stanley Townsend

Hint . . .

### Upside-Down Loading

If you've been having problems with I/O Errors when loading programs from cassette, try reloading with the cassette recorder placed upside down. It may not be technically refined, and it may not work, but when faced with the dreaded I/O it's worth a try. Besides, Rick Bullon, who suggested this method, says it works for him 90 percent of the time.



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## The CoCo Health Consultant: Health Programs

Interested in knowing whether your diet is providing the proper amounts of vitamins, minerals and protein? How about suggestions for supplements for certain physical ailments? Or maybe you just want to check your biorhythm for the next few weeks. These are all part of a package from Health Software called **Health Programs**. The package includes: "Deficiency Symptoms and Food Sources for 21 Different Nutrients," "Nutritional Therapy for 30 Different Ailments," "Pmode 4 Graph for 3-Week Biorhythm," "Text Mode Graph for 4-Week Biorhythm," and "Hypoglycemia Symptoms, Tests and Diet Recommendations."

The largest part requiring a 32K system, is the Diet program. To quote the introductory display, "Select from a list of 181 foods and see how much protein, calories, 11 vitamins and nine minerals are contained in your selections. The totals are individually compared to your RDAs if under age 19, or your MDRs if over age 18. It has 14 different RDA and MDR categories and adjusts for pregnant or lactating women 18 to 45 years old."

The package includes a two-page list of food items with codes and units of measure. To use the Diet program, enter age, weight, sex, and, if female, whether pregnant or not. The user is then asked if he/she uses vitamin supplements and, if so, the quantities of each. Then, using the list supplied, the user enters the quantities of food consumed for a full day up to 30 items. The program then displays the previously mentioned analysis of protein, vitamins and minerals.

The programs are well-written and perform as claimed. They are written in BASIC and come on tape or disk. In the tape version, the long Diet program is loaded using the high speed POKE to speed up the loading — even at that it takes about one and a half minutes to load. This program is too large to use with a disk even if the disk PCLEAR 0 is used. However, there is another copy of the Diet program on the 'B' side of the tape which can be loaded onto a disk.

Although the programs are easy to use, there are a few suggestions that could result in an even friendlier package. Some of the programs move to another screen simply by pressing ENTER while others require the entry of a specific number. Sometimes the choice is 1 or 2 and other times it's 5 or 6. There should be more consistency here. An improvement my wife would like to see would be the ability to enter three days' worth of diet instead of one to give a more representative average. The analysis takes four full screens to display and it would be nice to be able to direct this to a printer. Finally, the food list supplied with the package should also be included as a file so that if the original is lost or worn, a new one can be printed.

Is it worth buying? If you're interested in meeting your MDRs, the analysis can be very useful and the other programs in the package provide interesting information. The \$10 price is certainly quite fair for what you get.

(Health Software, 1521 Lancelot, Borger, TX 79007, cassette or disk \$10)

— James G. Kriz



## Line Editor Works Well with Compilers

*Line Editor* is a full-screen editor for Assembly and PASCAL source code. It edits text files that can then be used with Assembly or PASCAL compilers. It requires at least 16K Extended BASIC and uses the Hi-Res graphics to display a 51 by 24-column screen with true upper- and lowercase characters. The program features auto-repeating keys, fast screen routines, and built-in help screens to remind you of the different commands. Although it is sold on cassette, *Line Editor* works with both cassette and disk. The editor is in machine code, but has a BASIC loader which allows the user to make some modifications. All input and output is in ASCII so as to be compatible with other programs.

*Line Editor* is not compatible with *EDTASM+* type assemblers nor is it designed to edit BASIC programs.

At first, I couldn't get it to work. After following the instructions without success, I discovered there was a simple error in Line 0 of the BASIC loader. After fixing that line the program runs fine.

The editing capabilities of *Line Editor* compare well with other text editors with similar command options.

The manual is eight pages long and covers all the commands and operations of the program with suggestions for use and modifications. Unfortunately, the manual contains typos and mistakes and the help screens in the program also contain errors.

Commands sometimes work erratically with lines of text that contain only one or two characters. Editing is done primarily in an overstrike mode and inserting text is awkward. A line of text is restricted to 51 characters. If you exceed this limit, not only is anything past the 51st character hidden, but the commands sometimes act unpredictably.

There is no way to send files to a printer; a major shortcoming. Though you might be able to overcome this by modifying the BASIC loader, you cannot break out of the editor, modify the loader and then rerun the program. The text is lost if the program is re-entered with the RUN command. There is no way to re-enter the editor after performing a write to disk or cassette. The program simply ends. This makes it difficult to make saves periodically as you type in a long text file. Although you can append stored files to the text in memory, there is no way to save only a portion of the text in memory.

This program works well for its intended purpose but is of somewhat limited use. It is only for those with an assembly or PASCAL Compiler but no text editor to create files to use with them. Although it has a very reasonable price, *Line Editor* should have been debugged with more care. If you need such a program, *Line Editor* is for you.

(CMD Micro Computer Seives Ltd., 10447 124 Street, Edmonton, Alberta, T5N 1R7, distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette \$17.95 plus \$2 S/H)

— James Ventling

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**Note:** Our Fourth Year Index, including an index to all editions of RAINBOW ON TAPE, is included in the July 1985 issue.

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# Super Tutor — A Typing Tutor for Young Children

*Super Tutor* is designed to teach letter and number recognition to children ages 2 to 6. With the aid of parents, *Super Tutor* can be expanded to teach spelling.

The program arrived on disk. Actually there are four versions of *Super Tutor* on the disk. *Super Tutor* is divided into three learning levels. Each learning level has its own program. In addition, there is a main program that runs all three levels. The main program allows you to quickly switch between learning levels.

Level one teaches letter and number recognition. Each time a letter or number key is pressed the letter or number is drawn on the screen in large block form. The letters and numbers are drawn on a black background and colored white. Up to five rows of eight characters each can be displayed at one time. When a key is pressed the parent should tell the child the name of the letter or number. After a letter or number is displayed a short melody is played, which is usually a couple of notes designed to get the child's attention.

Level two teaches the child to recognize a letter or number on the keyboard. A random character is displayed and the child presses the appropriate key to cause the character to be displayed again. Nothing happens to the display until the proper character is pressed. When the child gives the proper response, the character is echoed to the screen and a short tune is played. In level two you can select training on letters or numbers only, or both letters and numbers.

Level three can be used to teach spelling. At the start of level three, enter the largest word length to be displayed, which can be from one to eight letters. In level three, words are displayed on the screen. The child must press each letter of the word in the proper order. When a correct letter is pressed the letter is displayed. When a word is entered properly an ear-catching melody is played. The parent must work along with the program to teach the child word pronunciation and spelling.

The *Super Tutor* package includes two pages of operating instructions. The instructions are straightforward and easy to understand. Included with the operating instructions is information on modifying and adding words to level three. The *Super Tutor* programs are written in BASIC. Words used in level three are located in lines 7000 and above. Up to 250 words can easily be placed in the data dictionary. *Super Tutor* comes with 50 words in the dictionary. You must know how DATA statements are written to modify or add words to the dictionary.

*Super Tutor* is easy to operate and performs exactly as described in the instructions. The author's telephone number is included in the instructions. Parents need to participate in the training in order for *Super Tutor* to work effectively. If you are looking for a program to teach young children the alphabet, numbers and early vocabulary, *Super Tutor* may fit the bill.

(Challenger Software, 42 Forth St., Pennsburg, PA 18073,  
32K ECB, tape or disk \$24 includes S/H)

— Gabriel Weaver



## Educational *Biosphere* is Fun and Challenging

Imagine cruising in a spaceship, as captain of *Arkworld*, and learning about a dying planet below. This is much more than a game. In *Biosphere*, the challenge is to save doomed alien life-forms as you fly about the galaxy. You must remember that your decisions will affect the ecology of the planet. It can be a very educational experience and is not for those who wish a shoot-'em-up action game.

*Biosphere* is a complex ecological Simulation that lets you decide how to populate the dying colony of each planet you land on. Your ship is filled with 100 plants and 100 animals, each with their own characteristics. You can choose from these or experiment with genetic engineering to compose as many as 10 new life-forms. You must examine the planet's environment, and then determine what combination of plants and animals to beam down.

Educators will marvel over the detail of the ecological system, and the glossary page. The manual is well-written and provides helpful insights into a successful Simulation.

The program is also well-written and user friendly. It employs eight icons to display the main actions. The left- and right-arrow keys select the icon/functions. The up- and down-arrow keys scan through the information. A display area between the icons uses words and pictures to depict the information. The bottom half of the screen simulates the control panels, computers and ship holding cells.

Each *Biosphere* Simulation is different since the native Colony is randomly generated. When the first icon flashes, information about the colony is displayed. The number of inhabitants varies depending upon your success in providing the correct balance of necessary ingredients.

Using the Environmental icon, information about the planet's temperature, humidity, wind direction and gasses present on the surface is displayed. During the Simulation, these factors change as the balance of nature is affected.

The Animal Manifest is next. Use the up and down arrows to scroll through each of the 100 animals in the ship's hold. Biological information is shown: Animal Name (listed one at a time, in alphabetical order), Order (what it eats), Intake/Expel (gasses breathed), Weight range, Temperature and Humidity range it can live in and Quantity. The Quantity is the only random factor from game to game (all

other characteristics remain constant). As each animal is displayed, determine how many (if any) you want to send to the planet. By studying the current environment, and that which will support the native life form, you are better prepared to save the dying planet.

The next icon, the Plant Manifest, works the same way as the Animal Manifest.

Genetic Engineering is next. If you choose to create an animal or plant, scroll through the Plant/Animal manifest lists. When you have chosen the two animals or plants you want to draw from, they appear in two boxes, and between them, your mutation: The Genetic lifeform appears! Five plants and five animals can be created this way.

The Window View is the view of the planet. You see a parade of animal life and growing plants. The author claims, "The beautiful sight of that teeming lifescape is the thrill that makes you glad you chose to be an ecologist." However, the view seems to start from the beginning each time, rather than continue from where it left off.

The Time Control icon displays the number of days the Simulation has been running, as well as the modes: normal, accelerated or hyper. In normal time, you make the choices and set up the Simulation. Printouts can also be made. In Accelerated time, one planetary day passes every 20 seconds. You can test the selections and make adjustments. Hyper time runs the Simulation at one day per second. Once in hyper time, the Simulation must run its course until all native animals have perished, or the ecology created proves to be stable by supporting the colony for 65,000 days. (This could take up to 18 hours to complete. But, until your decision-making skills are finely honed, the game is usually much shorter.)

The final icon is Archives. You can save a current Simulation, retrieve an already-created Simulation, or list the directory of previously saved Simulations. This allows saving choices before going into hyper time, and allows re-playing the Simulation after loading and changing the quantities to better your performance. It is recommended to save a record when beginning the simulation and several more times before entering hyper time. By looking at the environmental changes and observing the native colony's head count, you can monitor the effects of your actions.

Playing the game is easy. However, winning is another story entirely! The tips the author suggests are timely. A good strategy is to print out the entire animal and plant manifests so that you can learn about and refer to the wide range of possible combinations. In a school setting (or two-computer family), the use of a database on another computer would be a great way to choose the best life-forms to fit the needs of the simulation.

There is no suggested age range for this program. However, I would recommend it for middle-school age and older. Those who work with this Simulation will gain insight into the ecological principles that govern our own relationship to the planet Earth.

Required is 64K Color Computer, (color TV recommended) and one drive. *Biosphere* loads with the DOS command, or the BASIC program provided to start OS-9 on a Color Computer with a BASIC ROM prior to 1.1.

(Tandy Corp., available in Radio Shack stores nationwide, Cat. No. 26-3280, disk \$29.95)

— Dale Shell

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## French Package Sharpens Language Skills

It's been quite a while since I wrassled with French irregular verbs in high school and in college. The verbs won. Always. Every match. Although I never passed a French exam in my scholastic life, I always merited a 'C' because I tried so hard. I just never mastered the art of thinking in another language.

Here at THE RAINBOW, letters from our French-speaking readers land on my desk for translation. I still try as hard as I can and I'm still earning a 'C'. Perhaps if I had had a tool like *French Package* by David M. Compton to study with, I wouldn't have to live with the memory of my professor's parting words to me, "Monique, you sound like a child. You guess too much. It is amazing how much you guess right, but you *must learn*."

*French Package* requires 32K and comes on a non-protected disk so that backups for the user's convenience can be made. This program does not teach French; it is designed to help students reinforce material already studied. The documentation is three pages long and describes the programs within *French Package*.

From the menu, students may choose a quiz on the verbs aller, avoir, boire, s'asseoir and devoir, and from within each verb choose any of the 11 tenses or moods. The declensions are shown and the student responds with the correct verb form. Next are three categories of regular and

irregular verbs along with their tenses and moods (including my personal boogeyboo, the subjunctive). Past participles, future and conditional are among the choices. The student is presented with the infinitive and asked for the correct form.

There are quizzes on both relative pronouns and object pronouns. This was my second favorite part. I always knew the difference between "que" and "qui" (I just never placed them correctly in the sentence, so no credit). Vocabulary is tested and stumped me royally when "fertile" was rejected as the response to "fecond." There is a multiple choice test in English on French civilization and a multiple choice test in French on French history. That was my favorite part along with the quiz on the comparative and superlative forms of adjectives and adverbs — they were the only rounds in which I earned perfect scores on the first tries.


There are quizzes and reviews on "si" clauses, forms of "quel" and "lequel," interrogative pronouns and a test on the student's knowledge of imparfait versus passe compose (in which I proved once again, I really am an animal and can live and deal only with now). There are quizzes on regular verbs in the present tense and I was able to salvage some of my pride on those and the quizzes on numbers from one to 100.

Mr. Compton has included instructions to modify *French Package* so it can match different textbooks more closely. I believe if I had had a CoCo and *French Package* when I was in school, I could have spared my classmates all those dumb puppet shows I wrote and performed and probably could have passed my courses in the regular manner. All in all, *French Package* is a worthy learning aid and delighted me with how much I can still guess right.

(David M. Compton, 252 N. Main Street, Suffield, CT 06078, requires 32K, disk \$39.95 plus \$3 S/H)

— Monica Dorth

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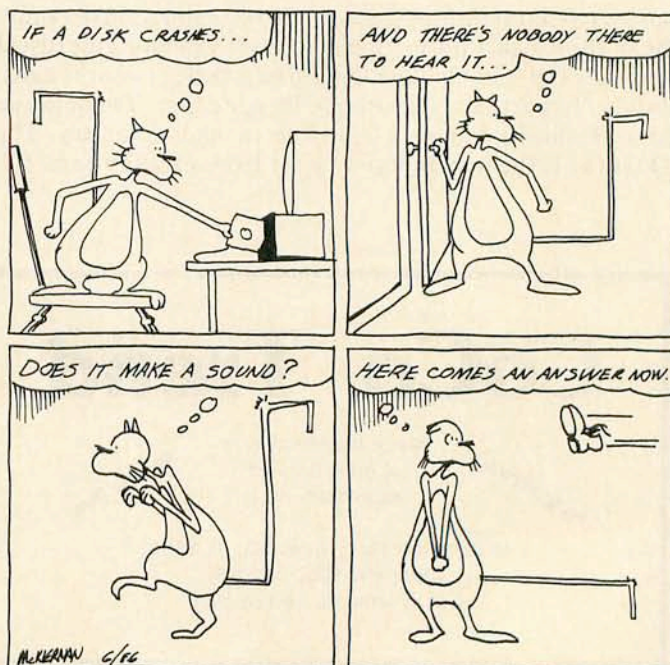
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## XSCREEN Gives High Resolution for OS-9

Have you ever wanted something besides the 32 characters per line on a green screen for your OS-9 system? Unhappy with inverse video instead of lowercase letters? Well here it is, and at an affordable price.

**XSCREEN** is a high resolution screen package for the OS-9 operating system of the Color Computer. Choose from 51, 64 or 85 characters per line. The display can be white or green characters on a black background, or black characters on a white or green background. All of these combinations have 24 lines per page. **XSCREEN** also has real lowercase letters.

The 85 characters per line is nearly impossible to read on a television. However, it is readable on a monitor. The 64 characters per line is available in two character sizes; wide and narrow. The wide characters seemed easier for me to read, but judge this for yourself. At 64 characters per line with either the wide or narrow characters, my eyes got tired after 15 minutes of work on the television. The 51 characters per line was easy to work with for long periods of time on a television or a monitor.

After **XSCREEN** is copied to the command directory, activate it by typing **XSCREEN**. You are presented with a menu for selecting the characters per line, and the foreground and background colors. It then returns to OS-9. If you need to change to a different style screen or want to quit **XSCREEN**, return to the menu by pressing the CLEAR and BREAK keys at the same time. If you quit **XSCREEN** and want the high resolution screen back again, reboot the system before executing **XSCREEN** again. This is stated in the manual in large bold letters.

**XSCREEN** uses about 12K bytes of user memory. This leaves about 28K bytes of memory for applications. If using BASIC09, you will have about 7,000 bytes of memory for your

Hint . . .

### Data Finder

Have you ever gone through your tapes or disks and found a data file that you couldn't identify? Well, I have, and it's a pain when you can't load it without the program and you can't find out what program it came from. Here is a program to solve your problems. Simply type in and run the program, and when it finds the file it will put it on the screen or on paper if you have a printer.

```
20 CLS:INPUT"WHAT IS THE NAME OF THE
DATA FILE";DFS$
30 OPEN "I",#1,DFS$
40 INPUT#1,DFS$
50 PRINT DFS$
60 IF DFS$="EOF" OR DFS$="" THEN 80
70 GOTO 40
80 CLOSE #1
```

If you want to load a data file from tape, change #1 to #-1 in lines 30, 40 and 80. If you want to print out the data, change line 50 to PRINT#-2, DFS\$.

Chris Stevenson  
Crocker, MO

application program. With the OS-9 editor you will have just over 24K bytes of memory for the text you are editing.

All of the OS-9 display functions are supported by **XSCREEN**. In fact, **XSCREEN** has additional display functions which make it much easier to write screen editing routines. These codes allow erasing to end of line, turning the cursor on or off, scrolling down and erasing to end of screen. There are also several codes to change the foreground and background colors of the display and change the number of characters per line. To get these additional display codes, **XSCREEN** uses some of the OS-9 graphics display codes. This may sound like a problem if you have existing programs that make use of these codes. It is not, and here is why. **XSCREEN** does not use the standard output /TERM. Instead it uses a driver called /HI. To perform the standard OS-9 graphics display functions, direct the display command to /TERM. OS-9 will process the display code the same as if **XSCREEN** was not present.

I tried **XSCREEN** with OS-9 version 2.0.0. It did not operate predictably. I hope the makers of **XSCREEN** will make the necessary changes so it will work properly with version 2.0.0.

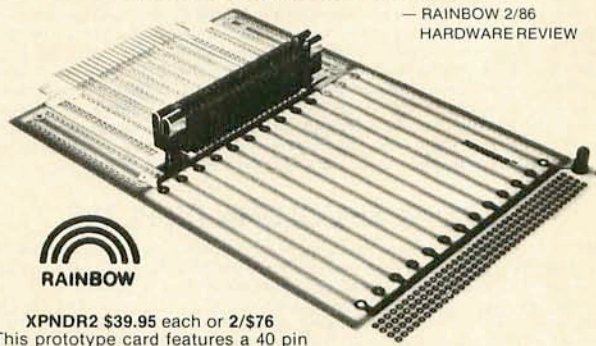
**XSCREEN** is well worth the price. It is nice to be able to get more than the 32 characters per line. If you cannot afford 80-column hardware, **XSCREEN** is the way to go.

(Microtech Consultants Inc., 1906 Jerrold Ave., St. Paul, MN 55112, disk \$19.95)

— Mike Piotrowski

### "XPNDR2 and SuperGuide - an Ideal Expansion Card Set"

— RAINBOW 2/86  
HARDWARE REVIEW



#### XPNDR2 \$39.95 each or 2/\$76

This prototype card features a 40 pin connector for projects requiring an on-line disk system or ROM paks. The CoCo signals are brought out to wire-wrap pins. Special gold plated spring clips provide reliable and noise-free disk operation plus solid support for vertical mounting of the controller. The entire 4.3x7 inch card is drilled for ICs. Assembled, tested and ready to run.

#### XPNDR1 \$19.95 each or 2/\$36

A rugged 4.3x6.2 inch bare breadboard that brings the CoCo signals out to labeled pads. Both XPNDR cards are double-sided glass/epoxy, have gold plated edge connectors, thru-hole plating and are designed with heavy power and ground buses. They're drilled for standard 0.3 and 0.6 inch wide dual in-line wirewrap sockets; with a 0.1 inch grid on the outboard end for connectors.

#### SuperGuide \$3.95 each

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# "The CBASIC Compiler"

## Now anyone can create fast efficient Machine Language Programs Easily and Quickly without having to use an Editor/Assembler

CBASIC is a fully integrated, easy to use Basic program Editor and Compiler package. CBASIC is 99% syntax compatible with Disk Extended Color Basic programs, so most Basic programs can be loaded and compiled by CBASIC with little or no changes required. The compiler is an optimizing two-pass integer Basic compiler that can convert programs written in Disk Extended Color Basic into 100% pure 6809 Machine Language programs which are written directly to disk in a LOADM compatible format.

The programs generated by the compiler can be run as complete stand alone programs. A built-in linker/editor will automatically select one and only one copy of each subroutine that is required from the internal run-time library and insert them directly in the program. This eliminates the need for cumbersome, often wasteful separate "run-time" packages.

### CBASIC WAS DESIGNED FOR BOTH BEGINNING & ADVANCED USERS

CBASIC is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. The Beginner or Novice programmer can write and compile programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC will handle it for you automatically. All they have to do is write their programs using the standard Basic statements and syntax. For the advanced Basic and Machine Language programmers, CBASIC will let you take command and control every aspect of your program, even generating machine code directly in a program for specialized routines or functions.

CBASIC adds many features not found in Color Basic, like Interrupt, Reset, and On Error handling. It also has advanced programming features that allow machine level control of the Stack and Direct Page registers, variable allocation, automatic 64K RAM control, program origin and even multiple origins. It can even have machine language code generated within a program that executes just like any other Basic program line.

### FULL COMMAND SUPPORT & SPEED

CBASIC features well over 100 Basic Commands and Functions that fully support Disk, Tape, Printer and Screen I/O. It also supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Extended Color Basic, and all with 99.9% syntax compatibility.

CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We had a report from a CBASIC user that claimed "a Basic program that used to take 3 hours to run, now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1 1/2 hours to run in Basic, now runs in 5 to 6 minutes!!!

### MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to Create and/or Edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequential lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built-in editor makes program corrections and changes as easy as "falling off a log". If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

### HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes its own Hi-Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PBJ "Word-Pak" and the Double Density 80 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled programs! If you want CBASIC to include the display driver in your program, all you have to do is use a single CBASIC command "HIRES". The run-time display driver that CBASIC includes in your program is not just a simple display, but a full-featured display package. With the Hi-Resolution display package you can mix text & graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more. All commands are compatible with our HI-RES II Screen Commander so you can easily develop screen layouts using HI-RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you this kind of flexibility?

### 64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6883 SAM (Synchronous Address Multiplexer) in the Color Computer. It will fully utilize the 96K of address space available in the Color Computer (64K installed) during program Creation, Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the user to use the upper 32K of RAM space automatically for variables or even program storage at run-time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

### ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi-Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

### THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC doesn't do this. ALL of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

### COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a "String Pool" like Color Basic. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC's string processing is so fast, it also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 strings, 64 characters each, you would DIM DAS(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AXS(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array DAS, you would still use DAS(30), the only real change is in the DIM statement. For undeclared string arrays of 10 elements or less, CBASIC will automatically reserve space for 10 (0-9) strings of 32 characters. In some other Color Basic compilers, you have to declare EVERY string variable used in the program in a DIM statement. And, to create an array of 40 strings with 64 characters each, you would have to DIM AD\$(2560), and then to access string #30, you would have to multiply 30 x 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

### CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on either system will run on systems with different ROMs. CBASIC is NOT compatible with JDOS.

### DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complex as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by simply flipping through the pages and scanning the Section titles on the top of the pages. The Manual itself is an 8 1/2 by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as being the Best program manual they have ever used.

### COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC's features to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large of a program can you write? Can you compile a complex string like: MID\$(RIGHT\$(DAS\$(VAL(IN\$(LEN(LE\$))),3,3)? Can you use two character variable names for string & numeric variables, like Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete Basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

### PRICE VERSUS PERFORMANCE

The price of CBASIC is \$149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We even traded in a few of them. If you want a cheap compiler, we'll sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

### ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of \$149.00 plus \$3.00 for shipping and handling to the address listed below.

To order by VISA, MASTERCARD or COD, call us at: (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST).

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- Generates Assembler compatible source files directly to disk.
- Generated source files are in standard ASCII format that can be edited by most word processors.
- Built in Hex/Ascii dump/display to help locate FCB, FCC and FDB areas in a program.
- Fast Disassembly mode for testing & checking FCB, FCC and FDB mapped areas.
- Built in Disk Directory and Kill file commands.
- Menu display with single key commands for smooth, Easy, almost foolproof operation.

## Starship Falcon

### Graphics Adventure Game

Six months ago a terrorist group demanded to be designated the rulers of Alpha Sigma III, under the threat of world starvation on the planet Earth. The Federation denied their demands, so they released a biological weapon which has destroyed all known edible plant species from throughout the known galaxy. To date no plant life has been able to survive on Earth. Recently, Federation undercover agents have reported a story told by a roving space trader, of a planet with abundant edible plant life. These plants have a reputation of being able to survive in all climates and in fact, are supposed to grow at an incredible rate. The Federation is desperate! If Earth's food source is not replaced soon, the Federation will have to evacuate all animal and Human life. Your mission is to go to the planet Zephyr and obtain the seed of these plants and return to Earth. Several Federation agents have been sent to obtain the seeds and none has returned! Can you get the seed and survive??? GOOD LUCK!

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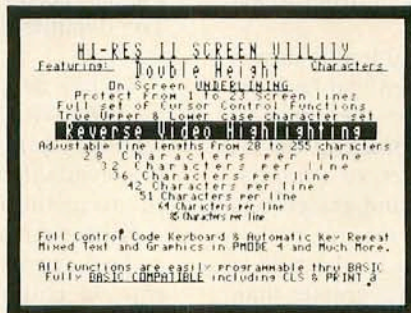
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	HI-RES II NEW	HI-RES I OLD	BRAND X
Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
XY Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16.32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85	Yes	No	No
Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function Switch to & from the Standard	Yes	Yes	No
16 by 32 Screen for full compatibility	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to			
Screen RAM	2K	2K	2K
Program Price (Tape)	\$24.95	\$19.95	\$29.95



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## Money Math Teaches Children Coin Values

If you have a young child who is excited about using money but confused about its values, *Money Math* may be a useful addition to your home or school library. *Money Math* is an educational program targeted for first- through third-grade children (and useful for remedial tutoring for upper grades). It uses high resolution graphics and a voice synthesizer (optional) to teach children the value of common U.S. coins and the dollar, how to count various combinations of coins and even how to spell them.

*Money Math* comes in two versions, a 32K program and a 64K version. The programs are identical except the 64K program offers voice prompts, help and encouragement by utilizing The Voice speech synthesizer from Speech Systems.

After the initial Hi-Res title page, which includes a display of the coins and dollar, the program displays a menu of 15 options comprising six categories. The categories are: Coin Values, Spelling, Count to \$1.00 with . . . , Count Coins, Mixed Coins and Choose Coins.

Selection from the menu is highlighted and made through movement of the up or down arrows and ENTER key. Large graphics coins are used throughout all options. (The quarter is one and one-half inches on a 13-inch screen; the rest of the coins are proportionally presented and easy to read.)

The first category, Coin Values, randomly shows the child the four basic coins (penny, nickel, dime, quarter) and the dollar along with the name of the currency. The child has to enter the value of the currency in either decimal or cents notation. The second category reinforces the correct spelling of the appropriate coins and dollar.

The next three sections (10 options) drill the child in counting coins, and offer the choice of counting to one dollar using a particular coin or of counting a variety of groups of coins. The easier counting categories require input in cents notation. The most difficult category, Mixed Coins, requires decimal notation when working with sums greater than one dollar. (The child is required to place the dollar sign and decimal point in the correct places in order to get credit for the problem.)

In the final category, Choose Coins, the student is shown a monetary value on the bottom of the screen and he must place an appropriate combination of coins on the screen to equal that value. This is accomplished by depressing the 'P', 'N', 'D' or 'Q' keys for pennies, nickels, dimes, or quarters. The selection of coins can be in any order and erased one coin at a time if desired.

Choosing Coins does not have the option of choosing a dollar bill, even if you are working with values greater than one dollar. My third-grade son wanted to use dollar bills and I thought about that idea myself. It might be a possible addition to the program. However, I can see many disadvantages to that approach. For example, dollars and dimes both begin with 'D', dollars take up considerably more space on the screen, and counting money problems become much more simplified and too easy to solve if dollars are used instead of coins to produce a dollar's worth of currency on the screen. Perhaps it might be best to leave this routine as is.

There are several additional features that should be

noted. The 'C' key is used to change the color of the penny to its copper color if it should be blue initially.

Normally, the child makes a selection from the menu and is drilled through a total of 10 problems before he is given a random musical and graphics reward and returned to the menu. The child may quit, however, at any time by pressing the CLEAR key, and return to the menu. Needless to say, there is no reward in such an action. The rewards are brief and entertaining, and have a positive influence on the kids. If using the 64K talking version, the child is also rewarded with verbal phrases like "congratulations," "super," "outstanding" and a surprising "supercalifragilisticexpialidocious."

The student can receive help at any time by pressing the space bar. Help is available in all levels at any time and always shows the child the correct answer or one of the possible solutions. Additionally, in the Mixed Coins category, the computer provides a step-by-step counting of each coin, accumulating the sum of each value at the bottom of the screen and highlighting the coins counted as each is added. The 64K version provides a verbal counting of the coins in addition to the visual presentation.

The right arrow is used to erase answers throughout all drills. It seems more natural for children who have used the CoCo to associate the left arrow with erasing. Perhaps it would be desirable to leave the right arrow in the program, but add one line of code to accept the left arrow erase as well.

I had a problem with trying to run the 64K program. My computer has always been able to handle the speedup poke (POKE 65495,0), until now. For some reason the placement of the poke within the program caused peculiar screen problems. After several attempts at various solutions, I took a close look at the software and discovered that removal of the speedup poke solved the problem. Therefore, if *Money Math* seems to load OK, but you have unusual effects or problems running the program, try replacing the POKE 65495,0 with POKE 65494,0 in lines 13 and 1000. You'll have to load the program *MONEYT* by itself, without following the normal instructions for loading, in order to edit that program. The author has been notified of the situation and a note probably will be added to the documentation. If you know that your computer can not use the speedup poke, be sure to mention it with your order. The documentation, by the way, is quite clear and easy to read.

*Money Math*, along with several educational programs by CY-BURNET-ICS, is tested and used in elementary school systems in Tennessee and is quite student friendly. It is available for Network use as well as individual family environment use.

Kindergartners seemed to need more help, but enjoyed using the program. Older, early-elementary kids loved it and enjoyed counting and manipulating money on the TV. I think *Money Math* shed a new light on some of the things they had been working with on paper at school. I highly recommend *Money Math*.

(CY-BURNET-ICS, 5705 Chesswood Dr., Knoxville, TN 37912, 32K ECB, cassette \$29.95, disk \$32.95)

— Kenneth D. Peters



## Options Galore with CGP-220 Screen Dump Package

The CGP-220 Screen Dump Package consists of six separate programs. Basically, they accomplish two things. Three of the programs create four-color pictures while the other three produce monochrome results. The package includes versions that run on 16K and 32K Color Computers. Two of the programs allow the user to print the two-screen images produced by CoCo Max. Memory limitations, however, require the user to be using at least a 32K machine.

The package is well-written and organized. Pretty menus were sacrificed for ease of use and efficiency of programming. The programs are easily transferred to disk for those who have disk drives.

Several printing options are provided in this package. When printing color images, the user can alter the printed colors as related to those shown on the screen. One can also select normal or double-sized images. When printing mono images, the options include printing in any of eight colors and the ability to print the negative of the image. These capabilities allow the creation of attractive, as well as weird, results. Imagine . . . purple people and blue pets.

Although the documentation explains all options, one thing needs to be clarified. The user is asked to CLEAR some memory before loading one of the programs. My gripe with this is that it doesn't tell the user how much memory to clear. Because of my past experience I was able to allow enough memory. However, a new CoCo user might not be so lucky. Also, the loading instructions should be organized in an itemized "step" fashion. These changes would be relatively simple.

All in all, CGP-220 Screen Dump Package is an excellent buy for \$14.95. Aside from those problems in the documentation, it surpasses products you might find elsewhere.

(CMD Micro Computer Services, Ltd., 10447 124th Street, Edmonton, Alberta, Canada T5N 1R7. Distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette \$14.95 plus \$2 S/H)

— Cray Augsburg

## Hall of the King Challenges Avid Adventurers

If you like Adventure games, and enjoy programs that show how far Color Computer programming has advanced in recent years, you should experience *Hall of the King* to see how good it gets.

Available from Prickly-Pear Software, *Hall of the King* is one of the best Adventure programs I have experienced to date. I wish I could report my victory but thus far I have been unable to solve the game. *Hall of the King* is a challenge for even the most avid Adventure player.

The opening credits are impressive and make you feel as though you're watching a show on television because the special effects are special. Next, you receive an in-depth background on the situation you're becoming involved in. You can review the scenario a page at a time at your own speed. The authors have taken time to research the topic while remaining imaginative so you're primed when the Adventure begins.

*Hall of the King* consists of two disks, and gives you a lot more playing time that you might need when an Adventure is so complex and challenging. Although there are two disks, only one disk drive is required, but you need to have 64K.

The graphics are many and well-done. *Hall of the King* is 100 percent high resolution graphics in detailed color. I enjoyed wandering through the *Hall of the King* admiring the programmer who spent so much time polishing all the fine details.

The response time to commands is almost immediate, except for a brief wait between commands while new graphics are drawn, which I didn't mind at all. There are SAVE and LOAD commands that make it possible for you to resume where you left off between games with ease. The packaging of the program is a vinyl container making it handy to grab and load. The documentation is thorough and well-done.

Good Adventures like *Hall of the King* keep the Color Computer's future bright.

(Prickly-Pear Software, 2640 N. Conestoga Avenue, Tucson, AZ, 85749, two disks \$39.95 plus \$1.50 S/H)

— Barbara Combes

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## Advanced Utilities — Five OS-9 Goodies

I was once asked, "What do you buy for the computer when you already have a word processor, a spreadsheet and a database?" I told the questioner to buy utilities. Utilities are those wonderful little programs that exist only to make the computer do more for us in an easier way. To this end, Computerware has released a set of five OS-9 utilities packaged together as *Advanced Utilities*.

The five utilities included in the package are *Kshell*, a direct, more powerful replacement for Shell; *Cpy*, a more powerful version of Copy; *Archive*, a backup utility to back up hard disks to floppies; *Flink*, a program to define what file to use as the boot file on the next reboot; and *Unload*, used to remove a program from memory by recursively unlinking it. The five utilities come on one disk, which is unprotected. Also included is a nine-page manual that explains the utilities and has examples for each. The explanation for *Kshell* is wonderful and covers all aspects of this utility. The other utilities seem to suffer a little, though.

*Kshell* is the showpiece of the package. This program takes the place of the shell to give a more powerful command interpreter. Its most powerful feature is its automatic wild card extensions. Any place on an OS-9

command line you would place a filename, you can use a wild card. Use it to match any file in the directory that corresponds to a pattern. The '\*' character matches any set of zero or more characters. The '?' character matches any single character. For example, the command "del \*.bas" deletes all files in the current directory that end with ".bas." The command "del file?.txt" deletes files such as "file1.txt," "file2.txt," "filez.txt" and any other file that fits the pattern. This works with all OS-9 commands that let you give a list of filenames on the command line. It does not work on OS-9 commands that only use the first filename found on the command line. For example, the ident command only reports the first file no matter how many are stated. Thus, a wild card used with ident still only gives one report.

Another feature of *Kshell* is its PATH variable. You may assign a value to PATH to tell OS-9 where to look for commands. The command PATH="/d0/cmds:/h0/cmds" tells OS-9 to look for a command first in /d0/cmds and then in /h0/cmds. You can give it as many paths to search as wanted. Although not stated in the manual, I am sure there is some limit on the number of characters the PATH can have.

In addition to the PATH variable, *Kshell* gives four user-defined variables or macros. These are called \$1 through \$4. You may give them any value and substitute them anywhere in an OS-9 command line. If you set \$1 equal to /d1/docs/reviews/advutil.txt, all you have to do to edit that file is enter edit \$1. In addition to saving repetitive typing, macros can be passed to procedure files. The command proc \$2="program" sets \$2 to the string "program" for the duration of the procedure proc. In the procedure file you would use \$2 in any place you would normally use a filename.

*Kshell* has also borrowed some ideas from the UNIX operating system. One of these is the use of the single opening quotation mark (') character. If a command is placed within single opening quotes, its first line of output is substituted at that point. For example the command echo Current directory is 'pwd' generates this: Current directory is /d1/docs/reviews. You can mix this with the macros. \$1='pwd' sets \$1 equal to the current execution directory.

Hint . . .

### Goin' Steady On BBS

Here is a short program to demonstrate how someone may get their messages to print evenly on a BBS.

```
1 REM RICHARD BECK
2 REM KISSIMMEE,FL
10 CLS: CLEAR 1000
20 LINEINPUT A$:CLS
30 GOSUB 50
40 IF INKEY$="" THEN 40 ELSE 20
50 FOR P=1 TO LEN(A$):PRINT MID$(A$,P,1);
60 X=X+1:IF X>26 AND MID$(A$,P,1)="" THEN
PRINT: X=0
70 IF X=30 THEN PRINT "-": X=0
80 NEXT X: X=0: PRINT: RETURN
```

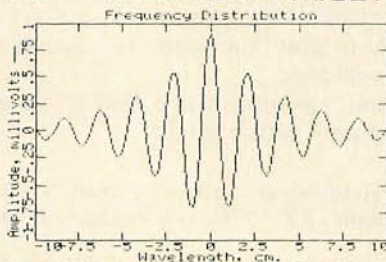
Richard Beck, IV  
Kissimmee, FL

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Also from UNIX, *Kshell* accepts either the standard CHD and CHX commands or the aliases of CD and CX. Comment lines under *Kshell* may begin with either an "\*" as in the normal shell or with an "#" as in UNIX.

The *Kshell* has a few other features. The command prompt can be set to whatever is wanted. The command "-p="Ksh>" would replace the OS9: prompt with Ksh>. Error reporting can be turned on or off. The command "-e" turns on full error messages like PRINTERR does. The difference is that a -ne command turns off error reporting. You can also specify what file to take the error messages from if you want to use something other than the system default. *Kshell* has improved upon the standard shell's redirection capability. The output of a command may be redirected to a file, to append to an existing file, or to overwrite an existing file.

To get all these extra features, you must give up something; what you give up is memory. *Kshell* reduces available memory by about 3.5K. This may be a problem if memory is tight. Using *Kshell* and a Hi-Res screen utility only left enough room for me to edit an 8K document with my word processor, as opposed to a 12K document under the standard shell. Those using the standard 32 by 16 screen or an 80-column hardware card may not miss that 4K as much.

If it seems that the other four commands are getting the short end of the stick here, you're right. They also get short-changed in the manual. While *Kshell* is covered in full detail with several examples for each command, the rest of the utilities are covered in less detail.

The *Cpy* utility is an improvement upon the Copy command. In addition to the standard Copy features, it can copy multiple files to a directory. Used with *Kshell*'s wild cards it can be very useful. The command "Cpy /dl/source \*.bas" copies all BASIC programs in the current directory to /dl/source. *Cpy* is a little confusing though. To copy one file to another, the syntax is "Cpy source destination," while to copy multiple files it is "Cpy Destdir source1 source2 source3 . . ." I have no idea why the author used two separate syntaxes on the same program.

The *Archive* utility is used to back up hard disks or large floppies to smaller media. It allows copying these large media to several smaller ones without splitting files over two different smaller medias. This command worked exactly as the documentation said it would and without any problems.

The *Unload* utility is a recursive version of Unlink. *Unload* removes a module from memory by repetitively unlinking it until it disappears from memory. This also worked as described.

The final utility, *Flink*, is an interesting one. It allows you to state what file the system is to boot from on the next reboot. Thus, you could have two or more boot configurations on a disk and choose which to use. This also seemed to work just as it is described.

What you get with *Advanced Utilities* is a very good replacement shell and four good utilities. The *Kshell* itself is worth the price. All five utilities were tested under both OS-9 Version 1.01 and Version 2.0 without any problems.

(Computerware, 4403 Manchester Ave., Suite 102, Box 668, Encinitas, CA 92024, \$29.95, requires OS-9 operating system)

— Mark Sunderlin

## Vegas Game Pak — CoCo Goes Casinoing

If you're having the gang over for a party soon, you'll be doing them and yourself a favor if you have the *Vegas Game Pak* on hand. It has six games, count 'em, and if your friends enjoy gambling, this is the next best thing to being in Nevada.

The selections include: Poker — Everybody's favorite card game, complete with graphics face cards and the ability to enter as high a credit line as you choose before the game gets under way. You may bet as much as five dollars per hand; Keno — The screen displays a series of 80 numbers. The challenge is to pick the 10 numbers you believe the computer will select. Your numbers are indicated by a blue checkmark until replaced by red checkmarks — should the computer choose one of your numbers. The game includes the capability of changing numbers if you want to change your selection before the action begins; Blackjack — Nice graphics cards with some handy options, including splits, doubles and insurance that allow you to increase your earnings fairly quickly, if you're lucky; Three different slot machine games, including Riteleft, Bar5 and 3Line. These are variations on the theme of spinning wheels, fruits and numbers.

All six games are written in machine language and are very responsive to user input. Betting is easy, the action is smooth, running totals of earnings are available and suspense is ever present.

*Vegas Game Pak* is fun. It is a good bargain because almost every one of these games would be a nice draw if sold separately.

(NovaSoft, 4285 Bradford N.E., Grand Rapids, MI 49506, tape \$29.95, disk \$27.95 plus \$2 S/H)

— Barbara Combes

Hint . . .

### Color Computer 2 Warning

If you are upgrading your new CoCo 2 to 64K, remember that the 16K chips you are taking out are *not* the same as the 16K chips (type 4116) that earlier CoCos used. They are type 2118, which use a different power supply (+5 volts only) and *will not* work in earlier units, and could cause damage. (If you intend to do a 32K "piggyback" expansion on your CoCo 2, use another set of 2118s, *not* 4116s that came out of an older computer.)



## NumberJack — An Auxiliary Keyboard Input Device

HJL has now provided the Color Computer with the long-missing Numeric Key Pad Area by introducing a device it calls NumberJack.

Initial reaction by many of you will be, "I have number keys already; what do I need another gadget for?" Well, I felt that way too, but my preference for HJL products (I own several) led me to try NumberJack. I do enough calculation and spreadsheet work to make reasonable use of the device. The question in my mind was whether spreadsheet use of it alone could justify its hefty price.

I am now convinced that NumberJack justifies its cost not just as a spreadsheet convenience, but as an auxiliary input device in the fullest sense of the word.

The unit is approximately six or seven inches on a side, and a few inches thick. The numeric keypad is attached to the computer by a length of ribbon cable that projects about two feet from the underside of the computer case on whichever side you choose. On the top are 24 keys, including the 10 digit keys (zero through nine), four arrow keys, four primary math operations (add, subtract, multiply and divide), two relational operators (< and >), and four computer control keys (@, CLEAR, SHIFT and ENTER).

A competent technician could install NumberJack in under three minutes, but the average owner may take closer to 15 minutes. The installation involves opening the case, removing the keyboard, and then connecting both the keyboard and the numeric key pad to a small T-shaped adapter board. This is then replugged into the keyboard connection receptacle. (The specimen I received included T-connectors for all versions of the CoCo; the shipping documents imply that you might receive only the adapter appropriate to your model.) In no case is soldering needed. For some CoCo 2 installations, an additional grounding pigtail is needed and supplied, and the method of attaching that is simple and well-planned. The computer case must be cut to let the ribbon cable out, and the ribbon cable must be attached to a ventilation slot to provide strain-relief on the cable. The other end of the ribbon cable is then plugged into a receptacle on NumberJack.

The directions warn that erroneous characters on the screen mean the cable is plugged in backwards. The best solution for that is to reopen the case and turn the ribbon the other way in the T-connector. Expecting that the average user may be reluctant to open his case, HJL advocates simply turning the cable over and plugging it into the NumberJack the other way. That will work also, but gives a less professional appearance.

Here I must fault HJL for a few minor shortcomings. The instructions do not mention that other sources of erroneous characters are stuck keys! I spent two hours trying to get the unit to work properly before I discovered that a small burr of plastic where the ENTER key rubbed on the edge of the cover was causing such anomalies as double characters when SHIFT-8 (the open parenthesis) was pushed, inoperative ENTER from the keypad but correct operation of ENTER from the main keyboard, and similar problems. I called HJL about the problem. They said mine was the only case of this problem so far reported and had me return the unit for

warranty re-work. I shipped it to them, and received a fully repaired unit in exactly eight days.

I can attest to the fact that customer support has been excellent; my own experience has been that questions normally receive return phone calls with adequate answers in under four hours. This is the first time I have had to return hardware to HJL, and a check with two local CoCo Clubs and a few local dealers indicated that hardware returns are rare for HJL, and that their service is consistent with the excellent phone support I experienced.

However, I feel strongly that the receptacle on the side of NumberJack and the connector inside the computer should both have been made idiot-proof, rather than simply suggesting reversing the plug in the receptacle. I say this because an upside-down plug on the unit looks bad, and I could very easily connect the cable to the unit with pins misaligned.

Once my unit was working, I tried some calculations and spreadsheets. Naturally, the unit worked as advertised, and I found the "phone dial" approach to number crunching significantly less tiring than the use of my normal keyboard. But then my kids interrupted. I have a three-year-old who is into Sesame Street educational software. I never realized how intimidated she had felt by the large keyboard when doing her simple preschool math. She grabbed NumberJack and wouldn't give it (or my CoCo) back! Her comprehension and speed rose dramatically, and I concluded that the more convenient arrangement of number keys can make a big difference in educational uses.

Next, my nine-year-old took over the CoCo to play a video game. He prefers to play *Frogger* with arrow keys rather than joysticks. Again, NumberJack was preferred to the normal keyboard input. Then, I tried modeming, and found that having a spare CTRL (alias CLEAR) key, or another ALT (alias '@') key was something to be appreciated.

My CoCo is stationed in the den, with a monochrome monitor facing one wall. The family TV is on another wall and serves as our color display. I often get backaches twisting to watch both displays when using software with color capability. Since 80 percent of my usage is word processing, I cannot justify replacing the monochrome monitor with a color one. Suddenly my swivel chair and the two feet of ribbon cable became the solution to the problem. A number of my programs were readily modified to accept punctuation or number responses in place of, and in addition to, the use of single letter responses to some prompts. Thus, I could turn in the chair with NumberJack on my lap and comfortably view the color display while retaining full control of the computer.

NumberJack is not just a spreadsheet convenience, but rather a true auxiliary keyboard input device. It may soon be viewed not as a luxury, but as a normal upgrade for the CoCo.

**(HJL Products, a division of Touchstone Technology, Inc.,  
955 Buffalo Road, P.O. Box 24954, Rochester, NY 14624,  
\$89.95)**

— H. Larry Elman



## Become a King in Wizard's Tower

Before he died, the Wizard King hid three magic talismen in the dungeon under his tower and protected them with monsters. Your quest is to find the three talismen and become king.

There is nothing I like better than a great Adventure game, but this is not really an Adventure game so much as it is a Dungeons and Dragons simulation.

Play takes place on three Lo-Res text graphics screens. The first screen shows the countryside with various terrain and monsters. After buying supplies in town (food, magic spells, weapons, armor), make your way across the screen to the tower. Upon entering, go to the Dungeon screen. It shows the corridors, treasure chests and evil creatures of the dungeon. The idea is to steal treasure chests while killing or avoiding the evil creatures. A treasure chest may contain gold or may have one of the magic talismen. The third screen is a smaller, simpler version of the second screen.

When you find the three talismen and return them to the village, you win. Before achieving that goal, however, you will have to return to the village for more food rations or better armor and weapons.

Unfortunately, the creatures (goblins, wizards, dragons, balrogs) are less than intelligent. Represented by text letters, they wander around on the screen. No matter how many you kill there are always the same number of them on the screen. Everytime you move, all of the creatures make a move.

The game is easy to learn and takes about a half hour to play. The graphics are not high resolution and the action can be slow and repetitive. The program is written in BASIC. If you enjoy programming you might like to modify it to correct for the slowness.

This game is a good choice for the price.

(Mitchell Software, P.O. Box 194, Tomahawk, WI 54487, \$9.95)

— James Ventling

## Telewriter-64 Character Set Editor

### Makes Modifications Easy

One of my most frequently used and favorite programs is *Telewriter-64*. This latest offering from CMD Micro makes this popular word processing program even more appealing.

The *Telewriter-64 Character Set Editor* provides an easy way to modify the character set used by *Telewriter-64*. Three new fonts are included with the program that demonstrate the capability of the software. "Descend" provides real honest-to-goodness descenders on the screen and "French" adds French characters to the vocabulary.

Modification of characters is simple. With the aid of cross hairs, arrow keys, and an eight-times larger-than-normal character, you can edit any character and make it look as you want it to. While you see real descenders, you will not be able to print them unless your printer has true descenders as well. You can modify characters to your heart's content, and the printout is not affected. However, if you have a printer that allows downloading character sets, you could use this program to create unique characters.

The program is menu driven and easy to use. The documentation is adequate, consisting of six pages of detailed instructions on the program's application and use. All modified fonts can be saved to tape or disk. The software is supplied on tape but can easily be transferred to disk. It works on all versions of *Telewriter-64* and is not copy protected, so backup copies can be made. I liked this program. It did what it was advertised to do and won't leave an empty spot in your wallet.

(CMD Micro, Computer Services Ltd., 10447 124 St., Edmonton, Alberta, Canada T5N 1R7. Distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette \$14.95, plus \$2 S/H)

— Jerry Semones

## ASSEMBLY LANGUAGE PROGRAMMING for the TRS-80 COLOR COMPUTER

At last - The book exclusively for you and your CoCo !! You've learned BASIC and are now ready to learn assembly language programming. This hands-on guide begins with the basics and progresses to the expert level; revealing programming conventions and techniques and all the internal capabilities of the TDP-100, CoCo 1 and 2. At every step of the way are illustrations, sample programs, and plain English explanations. All sample programs are shown as assembled with Radio Shack's EDTASM+ cartridge. Plus, a complete chapter explains how to use all EDTASM+ capabilities. This book describes how to write subroutines, interrupt handlers, programs that control the graphics display modes, cassette, disk, keyboard, sound, joysticks, serial I/O, interrupts, and use of ROM resident subroutines. Not only is the MC6809E microprocessor described, but also the video display generator (VDG), peripheral interface adapters (PIA), and

how they all work together. This book is suitable as a high school or college textbook.

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Portsmouth, RI 02871



## Modest Packaging Can't Hide SCRDMP10's Usefulness

Let's get the negative thing out at the beginning. *SCRDMP10* comes modestly packaged on an average quality commercial cassette. The documentation accompanying the cassette is two paragraphs that very briefly describes what the program does and how to get it up and running.

But don't be discouraged and don't be fooled. Once it's fired up, you discover that behind those humble trappings is one slick screen dump program that reproduces a PMODE 3 or 4 screen through a DMP printer with a minimum of fuss and bother.

*SCRDMP10* comes on a cassette in the form of a BASIC driver. When the program is run, you are provided with a pair of prompts. The first is for your printer's graphics control codes (ENTER defaults to those of the DMP-100, which worked fine with my DMP-110). The second prompt asks for a loading address, and here you may run into a snag, since the documentation is neither clear nor helpful (hint: Begin the routine from a cold start — POKE 113,0:EXEC40999, and if you have a DMP-100 or one of its cousins, try entering 14848). The actual ML program is poked in and you are given the choice of saving it to tape or disk.

Now you're home free. After loading or drawing the graphics screen, simply enter EXEC. You are prompted for the choice of background color (to reverse the printout) and the Baud rate for the printer. Position the paper at the top of the head, push ENTER, and away you go! It's as easy as that.

As soon as the print is finished, you are offered the choice of rerunning (again with the option of reversing the colors) or returning to BASIC to draw or enter another graphics screen and repeat the cycle.

The finished format is six and a half by seven inches sideways, and, as might be expected, there is a degree of distortion in the printout, relative to what is on the screen. I also discovered that I could not copy the ML program between drives. So, unless you are luckier than I, you'll have to use the Backup routine and then copy whatever else you might want on the disk with it. I'm not into drawing with my CoCo, but I did try the program as a tool for printing out graphs generated by Tom Mix's *Teachers Data Base* and billboards of some other pieces of software in my library. I had no problems at all.

The main problem with this software is its poor documentation. If you can get by that and the modest packaging, you have a quick and easy, black-and-white screen dump.

(Neat-O Software, Rt. #3, Box 205, Kingsport, TN 27664, cassette \$10 plus \$2 S/H)

— John Ogasapian

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## Algebra Simplifies and Solves Equations

*Algebra*, to the best of my knowledge, is the only program that solves equations as *equations*, rather than numerically, although it sometimes says zero is one solution to a particular equation, even while it continues to complete the solution algebraically.

It is somewhat difficult to describe just what it does but a few examples may help make it clear.

If you enter  $(X^2-6X)^2-2(X^2-6X)=35$ , *Algebra* displays  $X^4-12X^3+34X^2+12X-35$ . Enter  $3-X^2=2X^2+1$ , and you get  $3X^2-2=0$ .

$5X-2X^2=2$  produces  $-2X^2+5X-2$ ; ready to substitute into the standard binomial solution (very hard to write in a recognizable form here, but which goes like this:  $-B$  plus or minus the square root of  $B$  squared, minus  $4AC$ , all divided by  $2A$ ; a formula that stirs memories).

Here is an equation generated by the computer (the previous ones came from a math text):  $(F+A-(C-E)-B)*E*A=00$ ; one solution is  $A=0$  and the general solution is  $A=B-E-F+C$ .

Here is one last equation, this one also generated by the computer, which I did not verify:  $C/(C+F*B/((F+E-C)/(C+D)))=0$  and the solution is  $C=0$  and  $C=E+F$ . I spent about 10 minutes on this one and gave up!

Briefly put, *Algebra* simplifies or solves certain equations for any specified variable.

The only changes the user must make to his input equation is to specify every number as a letter, e.g.,  $23X-3Y$  must be written as  $AX-BY$  because the program treats everything, numbers included, as string variables.

If you don't change all numbers to letters, you often get incorrect-appearing solutions because the answer is written as "ABX" or something similar and, if 'A' and 'B' are left as numbers, you could get something like "12X" when the correct answer is "2X" (1 times 2X).

By specifying the numbers as letters, it is always obvious that the numbers are to be multiplied in the final answer.

Hint . . .

### Heads or Tails?

Have you ever wanted to devise a simple "odds/even" or "heads/tails" utility program? If so, this might help:

10 RND(2)-1	(YIELDS 0 OR 1)
20 RND(2)>1	(YIELDS 0 OR -1)
30 ((RND(2)>1)*2+1	(YIELDS 1 OR -1)

This is not made clear in the documentation and led to my initial conclusion that there was something wrong with the program (there wasn't).

When starting the program you select three different speeds which turn out to be our old friends, the CoCo speed pokes. These pokes don't work with all CoCos but will work with most and really speed up the operation of this program.

On normal speed I could always solve the equation faster than the computer, and I even kept up with it at high speed, but I am certain my accuracy would suffer if I solved several equations in a row, a problem the computer doesn't have.

The program's author is currently translating this program into machine language, which should greatly speed up execution, although it is now faster than many people who are inexperienced with this sort of problem.

The new version should be sent to the purchasers of the BASIC version when completed.

After selecting the speed the computer can handle, you either enter an equation to solve and then specify which variable to solve for, or you have the computer generate random equations and solve them as a demonstration.

Don't run the auto equation generator on the fastest speed. If you do, you won't be able to tell what is happening. If you get "stuck" in the fastest speed (where the display is garbage during calculations), press the BREAK key and rerun the program. Even though the screen is scrambled, this restarts the program without using the Reset button. When running your own equation in the fastest speed, the program stops at the end of a solution.

I found no bugs in this program and am impressed with the idea behind it.

I have seen better documentation but I can't remember ever seeing worse. The bad grammar, poor spelling, lack of information and generally sloppy appearance of the brief documentation that comes with this fine program are discouraging but shouldn't prevent you from purchasing the product because the program itself is very easy to use.

This is a very interesting program, probably unique in its function, that deserves attention. With some changes to the documentation this would be a fine program for anyone who has the need to solve linear equations or convert higher order equations to a form that can then be looked up in various tables.

It is a bargain and so easy to use that most people will find the instructions more of a minor annoyance than an obstacle. This program isn't flashy or complicated to use; it just sits there and lets your CoCo perform a task it has never been able to do before.

*Algebra* is the answer to many students' prayers for a program that would "really solve" some of those jumbled masses of numbers and letters that teachers always assign as homework.

The copy of *Algebra* that I received was not copy-protected and after starting the review I was informed that the price had been reduced to \$19.95, a giveaway price for this innovative piece of software. At this price I urge anyone with an interest in programming, or any use for this sort of program to buy a copy.

(M F Estes Softhead Co., P.O. Box 335, Elba, NY 14058, requires 32K, cassette or disk \$19.95 plus \$2.50 S/H)

— John McCormick



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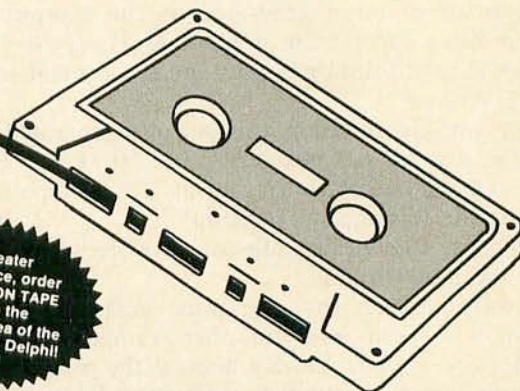
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### Programs from Our Past June Issues:

**June 1985 (Sound/Music Issue)** — *Piano Note Tutor*, a tutorial on the notes of the piano keyboard; *Minute Waltz*, a music program that brings classical composer, Frederick Chopin up to date; *Name That Song*, a game to test music and memory skills; *Multo of Mars*, a graphics game to learn multiplication; *Chopper Assault*, an arcade game of action; *Analog-To-Digital*, a sound synthesis program to put your voice into memory; *Simplifying the SOUND Command*, a tutorial on saving keystrokes and memory; *Animatic*, a demonstration program to ease the writing of animated graphics; *CoCo Chronograph*, a hardware/software project to add a real-time clock to CoCo; *Hi-Q*, a challenging puzzle peg game of skill; *Super Disk Charger*, a utility to put the "turbo" in your drives; plus 17 additional programs.

**June 1984 (Music Issue)** — *Tone Row*, a tutorial on 12 note/12 pitch composing; *Music+*, a music synthesis program for composing in four part harmony; *Room Layout*, a home utility to help rearrange furniture; *Election Tabulation*, a vote tallying utility; *Music 1812*, an entertainment program that produces some grand overtures; *Doodler*, a graphics program for CoCo Picassos; *CoCo Classics*, a music program to get a 'Handel' on 'Bach'; *Connect 4*, a game to test your skill; *Guitar Chords*, an aid in producing string music; plus 16 more programs.



## Super Duper Utilities Packs a Punch

Utilities are some of the most popular pursuits of the CoCo hobbyist. Human nature drives us to seek new ways of doing things quicker and easier. Our computers provide the opportunity. The new offering from Microcom Software definitely does some new things quicker. *Super Duper Utilities* is supplied on an unprotected disk and is written for a 32K ECB system. The author, Kishore M. Santwani of 500 Pokes Peeks & Execs fame, has done a good job. He has used his expertise to make CoCo do some pretty handy tasks, which I have listed here:

**40K Disk Basic** — A utility that gives 64K disk users 40K instead of the usual 32K of memory. Remember, Disk BASIC needs 2K for its own use, so there is only 38K to work with. Two versions are available, one for Disk BASIC 1.0 and one for version 1.1.

**Alphadir** — This utility reads the disk directory, then sorts and rewrites it in alphabetical order. This is handy for locating program names as your disk library grows larger.

**Basic Search** — Enables you to find all BASIC lines where a specified string is located. Very handy to find all those high speed pokes, as an example.

**Banner Creator** — Lets you create a large banner with seven-inch letters. Baud rate is selectable from the menu, ranging from 600 to 9600.

**Disk Encryption** — Provides password protection for BASIC programs on disk and keeps unauthorized people from accessing them.

**EZ Disk Master** — Lets you copy, kill and rename disk files, and to determine the starting, ending and executing addresses for ML programs. You can also run and execute programs directly from the menu.

**Function Keys** — Allows you to program any numeric keys (0-9) with strings of up to 250 characters each. This can be a very helpful feature during programming. For

example, you could press a key and automatically insert "print #-2" in the BASIC line.

**Graphics Zoom** — This utility is very impressive and easy to use. A menu allows you to look at the picture in memory and to select the area to be magnified four times. You can then modify the magnified area using arrow keys to move the cursor and the space bar for turning the cursor on or off and for modifying the picture.

**Large Screen Dump** — This program dumps PMODE 3 or 4 screen images to your DMP printer. The printout runs sideways and is twice the size of the graphics screen.

**List/Dir Pause** — I really liked this one! By pressing SHIFT/CLEAR, you can make the list pause in full screens instead of flashing by. A second SHIFT/CLEAR returns to the normal mode.

**Mailing List** — A handy mailing list right where you need it. You can delete or modify the records and sort by ZIP code. It prints to either screen or printer.

**Program Packer** — Removes all spaces and REM statements from BASIC programs. Reduces the memory requirements of BASIC programs.

**Super Input/Line Input** — This is a very useful utility and one which most programmers will love. It modifies the keyboard input routine to allow editing without having to access the EDIT command each time. Load it in and edit directly with a combination of arrow and CLEAR keys.

**Disk Zapper** — This utility allows you to change the data on the disk and recover most of the data in case of a crashed disk.

These utilities are useful and the fact that they are all on one disk makes this program even more appealing. However, in most cases, the user must type in a short BASIC line before actually using the utility.

But, they all work fine and the software is worthy of consideration. It offers helpful utilities at a reasonable price.

(Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, \$29.95 plus \$3 S/H)

— Jerry Semones

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Converting ASCII text from MS-DOS  
disks to CoCo disks

# The Great Transformation

By Marty Goodman

**M**uch as we love the CoCo, the fact is the IBM PC (and its clones) running Microsoft Disk Operating System (MS-DOS) is by far the most commonly used personal microcomputer for business. Many of you may use one at work, or have friends who use them.

This article is intended to provide you with a means of converting ASCII text files on a disk created using an MS-DOS computer into ASCII text files on a Color Computer-type disk. Next month, a companion article will provide you with the means of creating an MS-DOS-type disk on your Color Computer and the means to write CoCo text files to such a disk.

## System Requirements

A 64K Color Computer with Disk Extended BASIC (versions 1.0 or 1.1)

*Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator on CompuServe and Delphi. Among his numerous hardware and software designs, production and marketing projects, he introduced Graphicom and WEFAX to the CoCo world. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

and two disk drives are required for these programs. Two drives are needed to allow the file conversions to occur at a reasonable rate of speed. That is why no attempt was made to write this utility for single-drive systems.

The disk drives must be capable of fully accessing 40 tracks. There is no way around this; MS-DOS uses all 40 tracks. Most disk drives sold by third-party suppliers will access 40 tracks, as do most Tandy disk drives manufactured over the last couple of years. Most of the full-height drives Tandy sold in white cabinets will access 40 tracks. All of the half-height drives Tandy has been selling are capable of 40-track operation.

## The Problem of File Conversion

The Color Computer differs widely from the IBM PC. The CoCo uses disks formatted with 35 tracks and 18 256-byte sectors per track; the PC uses 40 tracks with nine 512-byte sectors per track. The CoCo uses single-sided disk drives; the PC uses double-sided disk drives. The CoCo uses a Western Digital or Fujitsu brand disk controller chip; the IBM PC uses a NEC disk controller chip. The CoCo uses the Radio Shack Disk BASIC operating system; the PC uses MS-DOS. All of these differences cause problems.

The fact that many IBM PC word

processors store files in a form that is not exactly ASCII text causes further complications. You simply have to make sure the files you wish to read on the IBM PC-type disk are pure ASCII text. Most programs that do not normally use pure ASCII for text storage provide, as an option or separate conversion program, the means of turning their file format into pure ASCII.

Working in our favor is the fact that both computers use the same size disk, that Microsoft wrote the code for both MS-DOS and Disk BASIC, and that the Western Digital (or Fujitsu) disk controller chip can read or write anything written by the NEC controller chip. (Oddly, the NEC chip cannot read everything written by the Western Digital chip. In converting CoCo material to an MS-DOS disk, one has to take the special limitations of the NEC chip into account when formatting a disk for it using the Western Digital chip.)

I have added one feature to my MS-DOS-to-CoCo conversion program. It pokes a little routine into memory that sets the high order bit of all characters in the MS-DOS file to zero before converting them to CoCo disk format. It also strips out line feeds from the MS-DOS file.

Most MS-DOS ASCII and other text files end lines with a carriage return character (Hex \$0D), followed by a line



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Screen

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feed character (Hex \$0A). But CoCo word processors are accustomed to seeing lines ended *only* by the carriage return. Some CoCo word processors automatically remove any line feeds they may find in a file. *Telewriter-64* is one example. However, some CoCo editors (i.e. the editor for Macro 80C) choke on a file if it contains line feeds. In general, when converting text from an MS-DOS system to a CoCo Disk BASIC system, it is useful, sometimes mandatory, to strip off line feeds. The resetting of the high-order bit to zero should help convert *WordStar* and some other type files into ASCII for compatibility with CoCo word processors and editors.

The "filter" routine that does the line feed and high-order bit stripping is executed in Line 5050. If you want to have the file converted without this filter, just delete Line 5050: load the converter program, then before running the program, type 5050 and press ENTER. This deletes Line 5050 and disables the filter. You may want to save the program with that line deleted.

#### Program Limitations and Idiosyncrasies

There are several limitations with this file conversion program. First, it can only read single-sided disks (because so few CoCo owners use double-sided disk drives). Virtually all MS-DOS users use double-sided disks. However, originally MS-DOS used single-sided disks, and to maintain backwards compatibility, the current versions of MS-DOS have the ability to read and write single-sided versions of MS-DOS disks. In order to create an MS-DOS disk that can be read by a CoCo with single-sided drives, the user must first format a single-sided disk on the MS-DOS machine. Under MS-DOS, do this with Drive B and give the command `FORMAT B: /1`.

After prompting you to put a blank disk in Drive B, the computer formats a single-sided MS-DOS disk. You must transfer any files you want converted to that disk. Only MS-DOS disks prepared in this manner can be read by this MS-DOS-to-CoCo conversion program. (It is possible to write a conversion utility to read double-sided [normal] MS-DOS disks on the CoCo, but double-sided drives are required.)

MS-DOS supports volume labels and subdirectories. To keep the conversion program simple, I elected not to write code that took either into account. Therefore, the files you wish to transfer *must* be put in the Root directory of the single-sided MS-DOS disk. This pro-

gram ignores volume labels, subdirectories and killed files, but I do suggest not having any of these things on the disk you are preparing for file conversion.

Files can be of any length, but the computer reads and writes data a sector at a time. To keep the code simple, I made it convert files a sector at a time and let the last sector in each file be fully converted, even if the file is supposed to include only part of that last sector. The result is that it adds some trash at the end of files it converts, although all of the file does get converted. This extra trash often shows up as part of the original file itself. Indeed, that trash will very often be material from just before the end of the file. But if you look a little farther back, you'll see the true end of the file, followed by up to 255 characters of text, which is a repeat of stuff near the end of the file. The extra trash can be edited out with a word processor.

One note for *Telewriter* users: *Telewriter* does weird things when it encounters a caret sign in incoming text. The caret itself is not displayed, and the

---

**"I made it convert  
files a sector at a  
time . . ."**

---

character following it is lost or altered. I suggest you make sure there are no caret signs in the text you convert. If need be, first edit the text using an MS-DOS-based word processor on your MS-DOS machine.

Users of *VIP Writer* will need to do a little extra work to prepare their files for loading into the word processor. Unfortunately, *VIP* is set up to interpret a null as an end-of-file marker. This MS-DOS-to-CoCo conversion routine doesn't actually remove the line feeds; it converts them into nulls. Because of this, *VIP* loads only the first line of the converted text. The rest is ignored as the null at the end of the line tells *VIP* it has reached the end-of-the-file.

To correct this, *VIP* users need to delete Line 5050 in the main program. This tells the converter not to strip the line feeds. Then, after the conversion is complete, you can do one of two things: 1) Leave the file as is and edit out the line feeds (the hard way), or 2) Run the file through the program in Listing 2 and answer the prompts. This listing strips the line feeds right out of the file.

#### Using the Program

First, make up your MS-DOS single-sided disk with MS-DOS ASCII text files you want to convert. Be sure to put all files in the Root directory. Be sure the disk does not have a volume label, subdirectories or a killed file. Put that disk in your CoCo's Drive 1. Put a disk with this conversion program (*MS2COCO.BAS*) in Drive 0. Type `LOAD "MS2COCO"` and `RUN`. Upon seeing the title page, make sure your specially prepared MS-DOS disk is in Drive 1, then press ENTER. Follow the prompts to view all entries on the root directory of the MS-DOS disk. Select the entry you want to convert by typing its number, then pressing ENTER when asked to confirm that selection.

Be sure you have adequate blank space on the Disk BASIC disk in Drive 0. That disk must be formatted in ordinary format — just follow the prompts. After selecting the file on the MS-DOS disk you wish to convert, you are asked to choose a filename for it as it will appear on the CoCo disk. Note that you are only to enter an eight-letter filename; the program automatically assigns the extension `"/TXT"`.

The speed of file conversion is roughly 2400 Baud. This is accomplished by a sneaky programming trick, the "VARPTR trick." You might wish to examine the code between 5000 and 5200 to see how the `VARPTR` statement is used to help create a 256-character long string in one fell swoop.

During file conversion some curious numbers appear on the bottom of the screen. These numbers were put there mostly to help debug the program. Going from left to right, they represent the cluster number, track and sector number on the MS-DOS disk that is currently being acted on.

On the right bottom part of the screen you will see a display of the number of bytes that remain to be converted. As the file is converted, that number decreases to zero. The number gives an idea how far along the program is in the process of file conversion. When the program is done converting a file, it prompts with a beep and asks if you are done or if you want to convert another file.

Special thanks go to Don Hutchison (user name `DONHUTCHISON` on Delphi) for his beta testing of this utility and his help in dealing with line feeds, including the program in Listing 2. Also to Art Flexser (`ARTFLEXSER` on Delphi), author of *ADOS*, for his help in suggesting the `VARPTR` trick and for providing a routine from which Don



derived the line feed-stripper program. Thanks to Cray Augsburg (RAIN-BOWMAG on Delphi) for his beta testing that revealed the problems to be encountered by users of *VIP Writer*. Extra special thanks go to Fred Cisin, author of *Xenocopy*, who spent hours patiently teaching me about MS-DOS disk file structure.

Next month we'll present the other half of this package: a group of programs that allow you to format an MS-DOS-type disk on the CoCo and to write Disk BASIC text files onto that MS-DOS disk using the CoCo. A short simple BASIC program will be included that inserts line feeds into CoCo ASCII files after the carriage return, making such files more palatable to MS-DOS-

type text handling programs.

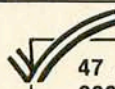
For those with other file conversion needs, please take note of the following:

Mark Data Products makes a program called *CoCo Util* that converts to and from Disk BASIC on an MS-DOS-type machine. (Note that this is an MS-DOS program and runs only on MS-DOS machines.) It does, of course, support double-sided MS-DOS disks. Mark Data Products, 24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691, (714) 768-1551.

D.P. Johnson makes conversion utilities to handle file conversions between OS-9 and MS-DOS disks. These utilities run on the Color Computer under OS-9 and support double-

sided disk drives. D.P. Johnson, 7655 S.W. Cedarcrest Street, Portland, OR 97223, (503) 244-8152.

For those with an IBM PC or other MS-DOS machine who wish the ultimate in file conversion utilities, let me recommend *XENOCOPY II*. It runs on nearly all MS-DOS machines, and reads from, writes to and formats over 250 different disk formats. This includes OS-9, Color Computer and hundreds of CP/M variant formats. If you obtain special hardware, this conversion program also supports a number of eight-inch and 3½-inch disk formats. *Xenocopy II* is available from Xenosoft, 1454 6th Street, Berkeley, CA 94710, (415) 525-3113. □



47	.....227	3043	.....21
200	.....79	9030	.....110
445	.....21	10090	.....51
610	.....104	13003	.....178
750	.....190	END	.....144
2110	.....161		

Listing 1: MS2COCO

```

1 CLEAR 512,&H5DFF
2 PCLEAR 4
3 DIM LKS(8)
5 DIM NTRYLC(8)
20 IS=&H60:ID=&H6000 'MS DOS DAT
A SECTOR BUFFER
25 FS=&H62:FD=&H6200 'FAT BUFFER
30 DS=&H66:DD=&H6600 'MS DOS DIR
ECTORY BUFFER
35 DEND=&H71FF 'END OF DIRECTORY
40 POKE &H7E00,&H8E:POKE &H7E01,
&H60:POKE &H7E02,0 'LDX #$6000
41 POKE &H7E03,&HA6:POKE &H7E04,
&H84 'LDA 0,X
42 POKE &H7E05,&H81:POKE &H7E06,
&H0A 'CMPA #$0A
43 POKE &H7E07,&H26:POKE &H7E08,
&H03:POKE &H7E09,&H4F 'BNE $7E0C
CLRA
44 POKE &H7E0A,&H20:POKE &H7E0B,
&H02:POKE &H7E0C,&H84:POKE &H7E0
D,&H7F 'BRA $7E0E ANDA #$7F
45 POKE &H7E0E,&HA7:POKE &H7E0F
,&H80 'STA ,X+
46 POKE &H7E10,&H8C:POKE &H7E11,
&H62:POKE &H7E12,&H00 'CMPX #$6
200
47 POKE &H7E13,&H25:POKE &H7E14,
&HEE:POKE &H7E15,&H39 'BCS $7E03
RTS

```

```

49 REM DELETE STEP 5050 TO KILL
THE FILTER.
60 H=PEEK(&HC004):L=PEEK(&HC005)
:DKON=256*H+L
100 CLS:PRINT@32," MS DOS TO COC
O TEXT FILE XFER"
105 PRINT" FOR SINGLE SIDED MS D
OS DISKS"
110 PRINT:PRINT" (C) MARTY GOODM

```

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```

AN JAN 1, 1986":PRINT
115 PRINT"FOR EITHER 8 OR 9 SEC
/ TRK."
120 PRINT"ONLY ROOT DIRECTORY FI
LES CAN"
125 PRINT"BE CONVERTED.  FORMAT
THE DISK"
130 PRINT"YOU WILL PUT THE MS DO
S FIES"
135 PRINT"ON USING THE COMMMAND:
":PRINT
140 PRINT"  FORMAT B: /1"
145 PRINT:PRINT"  PLACE SINGLE SI
DED MS DOS DISK"
150 PRINT"    IN DRIVE 1 AND TAP
ENTER";
190 IF INKEY$ <> CHR$(13) THEN G
OTO 190
200 REM READ IN FIRST SECTOR OF
FAT
210 POKE &HEA,2:POKE &HEB,1:POKE
&HEC,0:POKE &HED,2:POKE &HEE,FS
:POKE &HEF,0
220 EXEC DKON
230 IF PEEK(&HF0) <> 0 THEN GOTO 9
000
300 REM CHECK FOR 8 VS 9 SECTOR
PER TRACK

```

```

310 GN=0:GOSUB 15000:T=CV AND 15
320 TS=0
330 IF T=&HE THEN TS=8
340 IF T=&HC THEN TS=9
350 IF TS=8 THEN GOTO 400
360 IF TS=9 THEN GOTO 450
370 CLS:PRINT@256-29,"WRONG KIND
OF MS DOS DISK"
380 PRINT"  TAP ENTER TO RESTART
PROGRAM"
390 IF INKEY$ <> CHR$(13) GOTO 390
395 GOTO 100
400 REM INPUT 8 SEC /TRK DIRECTO
RY
410 FOR N=4 TO 7
420 POKE &HED,N
430 POKE &HEE,DS+(2*N)-8
435 EXEC DKON
440 IF PEEK(&HF0) <> 0 THEN GOTO 9
000
445 NEXT N
447 GOTO 500
450 REM INPUT SECOND FAT SECTOR
AND ALL OF DIRECTORY
455 FOR N= 5 TO 9
460 POKE &HED,N
465 POKE &HEE,DS+(2*N)-12
470 EXEC DKON

```

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```

475 IF PEEK(&HF0) <> 0 THEN GOTO 9
000
480 NEXT N
490 GOTO 500
500 REM PUT DIR ON SCREEN
510 K=0:LKS(0)=0:Z=0
515 REM LOOP
520 CLS:PRINT@8,"DIRECTORY LISTI
NG"
530 PRINT@64,"    FILENAME.EXT
SIZE"
540 GOSUB 13000
550 IF FE=0 THEN GOTO 700
555 IF Z=0 THEN GOTO 750
560 F$="M" 'MIDDLE OF DIR
570 PRINT@512-96,"    ENTER CHOIC
E NUMBER OR"
580 PRINT"    UP OR DOWN ARROW TO
SEE"
590 PRINT"    PREVIOUS OR NEXT CH
OICES";
595 F$="M"
600 Z=Z+1:LKS(Z)=K
610 A$=INKEY$
615 IF A$="" THEN GOTO 610
620 IF A$=CHR$(10) THEN GOTO 680
625 IF A$=CHR$(94) THEN GOTO 660
627 IF VAL(A$)=0 THEN GOTO 610

```

```

630 IF VAL(A$)>Q THEN GOTO 610
635 CLS:VV=VAL(A$)-1:GOSUB 16000
:GOSUB 17000
640 PRINT@32,"YOU HAVE CHOSEN:"
645 PRINT:PRINT NAM$,FZ
650 PRINT:PRINT"HIT ENTER TO PRO
CEED, OR"
652 PRINT"ANY OTHER KEY TO RETUR
N TO MENU."
656 A$=INKEY$:IF A$="" GOTO 656
657 IF A$=CHR$(13) THEN GOTO 200
0
659 Z=Z-1:K=LKS(Z):GOTO 515
660 IF FE=0 THEN GOTO 610
662 K=LKS(Z):GOTO 515
680 IF Z=1 THEN GOTO 610
682 Z=Z-2:K=LKS(Z):GOTO 515
700 PRINT@512-96,"    END OF DIRE
CTORY"
710 PRINT"    ENTER SELECTION OR
DOWN ARROW"
720 PRINT"    TO SEE PREVIOUS PAG
E";
730 GOTO 600
750 PRINT@512-96,"    TOP OF DIRE
CTORY"
760 PRINT"    ENTER SELECTION OR
UP ARROW";

```

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```

780 PRINT" TO SEE MORE ENTRIES
";
790 GOTO 600
2000 REM FILE TRANSFER SECTION
2020 HCLU=40*TS
2030 CLS:PRINT@32,"PUT COCO DISK
IN DRIVE 0"
2040 PRINT"AND INPUT A FILE NAME
"
2045 PRINT"USE UP TO 8 LETTERS A
ND"
2050 PRINT"DO NOT USE AN EXTENTI
ON!"
2060 PRINT:INPUT CFN$
2070 IF CFN$="" THEN GOTO 2030

```

```

2075 IF LEN(CFN$)>8 THEN GOTO 20
30
2080 OPEN "O",1,CFN$+"/TXT:0"
2090 CURCLU=BC
2092 IF TS=8 THEN QQ=5
2093 IF TS=9 THEN QQ=7
2095 ZCLU=INT (FZ/512)+1
2097 CLS:PRINT@256-32," NOW TR
ANSFERRING THE FILE"
2098 PRINT@512-96,"CLUSTER TRACK
SECTOR #BYTES"
2100 FOR M=1 TO ZCLU
2110 IF CURCLU>HCLU THEN M=M+1:G
OTO 2260
2120 X=CURCLU+QQ:T=INT (X/TS):S=X

```

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```

-TS*T+1
2130 PRINT@480+2,CURCLU;:PRINT@4
80+20,FZ-(512*(M-1));
2140 GN=CURCLU:GOSUB 15000:CURCL
U=CV
2200 GOSUB 5000
2210 IF CURCLU=0 THEN GOTO 190
2220 IF CURCLU>HCLU THEN GOTO 22
50
2230 NEXT M
2240 GOTO 3000
2250 IF CURCLU=&HFFF THEN M=M+1
2260 NEXT
2270 GOTO 3000
3000 PRINT #1,CHR$(&H0D);
3005 PRINT#1,CHR$(&H1A);
3010 CLOSE
3015 PRINT@480+20,"      ";;PRINT
@480+20,LB;
3020 SOUND 100,10
3030 PRINT@256-32,"      TRAN
SFER DONE
3040 PRINT" TAP ENTER TO TRANSFE
R MORE "
3043 PRINT" TAP ANY OTHER KEY TO
EXIT"
3045 A$=INKEY$
3050 IF A$="" THEN GOTO 3045
3060 IF A$=CHR$(13) THEN GOTO 10
0
3070 CLS:END
5000 REM INPUT SECTOR TO BUFFER
5010 PRINT@480+9,T;:PRINT@480+15
,S;
5020 POKE &HEA,2:POKE &HEB,1:POK
E &HEC,T:POKE &HED,S:POKE &HEE,I
S:POKE &HEF,0
5030 EXEC DKON
5040 IF PEEK(&HF0)<>0 THEN GOTO
9000
5050 EXEC &H7E00
5060 A$=""
5065 P=VARPTR(A$)
5070 POKE P,128
5075 FOR Y=0 TO 3
5080 Z=ID+Y*128
5085 GOSUB 5200
5090 POKE P+2,MSB:POKE P+3,LSB
5100 PRINT#1,A$;
5110 NEXT Y
5130 RETURN
5200 MSB=INT(Z/256)
5210 LSB=Z-MSB*256
5220 RETURN
9000 REM PRINT DISK I/O ERROR
9020 CLS:PRINT@256-32,"      DIS
K ERROR ... SORRY!"
9030 PRINT" TAP ENTER TO RESTART

```

```

PROGRAM"
9040 IF INKEY$<>CHR$(13) GOTO 90
40
9050 GOTO 1000
10000 REM GET INFO FROM DIR
10001 REM NT IS ENTRY NUMBER
10002 REM NAM$=FILENAME ON EXIT
10003 REM F1=7 IF INVALID ENTRY
10004 REM F1=0 IF VALID ENTRY
10005 REM F1=1 IF SUBDIR
10006 REM F1=2 IF KILLED FILE
10007 REM F1=3 IF FREE (END OF
DIR)
10008 REM F1=4 IF ENTRY POINTS
BEYOND THE BUFFER SPACE.
10009 REM BUFFER SPACE IS FROM
$6600 THRU $71FF (6 SECTORS)
10010 REM OR 96 TOTAL ENTRIES.
10011 RE A=ATTRIBUTE BYTE
10015 ZZZ$=CHR$(&HE5)+STRING$(7,
CHR$(&HF6))
10020 DLOC=DD+32*NT
10030 IF DLOC>&H71FF THEN F1=4:R
ETURN
10040 FB=PEEK(DLOC)
10060 IF FB=0 THEN F1=3:RETURN
10070 NAM$=""
10080 FOR N=0 TO 7
10090 NAM$=NAM$+CHR$(PEEK(DLOC+N
))
10100 NEXT N
10104 IF NAM$=ZZZ$ THEN F1=3:RET
URN
10105 IF FB=&HE5 THEN F1=2 :RETU
RN
10110 NAM$=NAM$+"."
10120 FOR N=8 TO 10
10130 NAM$=NAM$ +CHR$(PEEK(DLOC+
N))
10140 NEXT N
10145 F1=0
10150 A=PEEK(DLOC+11)
10155 T=A AND &H10:IF T<>0 THEN
F1=1
10160 T=A AND &H08:IF T<>0 THEN
F1=7
10200 RETURN
11000 REM FOR GIVEN ENTRY NUMBER
11001 REM GET FILE SIZE (FZ)
11002 REM AND BEGIN CLSTR (BC)
11010 DLOC=DD+NT*32
11020 FZ=PEEK(DLOC+28)+PEEK(DLOC
+29)*256+PEEK(DLOC+30)*65536+PEE
K(DLOC+31)*65536*256
11030 BC =PEEK(DLOC+26)+PEEK(DLO
C+27)*256
11040 RETURN
13000 REM GET 8 DIR ENTRIES

```



```

13002 REM Q=VALID ENTRY COUNT
13003 REM K=KOUNT OF ALL ENTRIES
13004 REM FE=255 IF MORE NTRIES
13010 Q=0:FE=255
13013 SCST=128
13015 REM LOOP
13030 NT=K
13040 GOSUB 10000:GOSUB 11000
13050 IF F1<>0 GOTO 13200
13100 NTRYLC(Q)=DLOC
13107 PRINT@SCST+32*Q,Q+1
13110 PRINT@SCST+3+Q*32,NAM$
13115 PRINT@SCST+19+Q*32,FZ
13120 Q=Q+1
13200 K=K+1
13210 IF F1=3 THEN FE=0:RETURN
13220 IF DB+32*K>DEND THEN FE=0:
RETURN
13230 IF Q>7 THEN RETURN
13240 GOTO 13015
15000 REM READ FAT
15001 REM GN =CLUSTER ENTRY#
15002 REM GN=0 TO 440
15003 REM CV = CONTENTS OF THE
CLUSTER NUMBER REQUESTED

```

```

15010 GIN=INT(GN/2)
15020 GCN=3*GIN
15030 GF=GN-2*GIN
15040 B1=PEEK(FS*256+GCN)
15050 B2=PEEK(FS*256+GCN+1)
15055 B3=PEEK(FS*256+GCN+2)
15060 N1=(B1 AND &HF0)/16
15070 N3=(B2 AND &HF0)/16
15080 N5=(B3 AND &HF0)/16
15090 N2=B1 AND &HF
15100 N4=B2 AND &HF
15110 N6=B3 AND &HF
15120 IF GF=0 GOTO 15200
15150 CV=N3+N6*16+N5*256:RETURN
15200 CV=N2+N1*16+N4*256:RETURN
16000 DLOC=NTRYLC(VV):GOTO 10030
17000 DLOC=NTRYLC(VV):GOTO 11020

```

#### Listing 2: STRIPLF

```

10 'LINEFEED STRIPPER
20 'BY DON HUTCHISON [70425,1225
]
30 'ADAPTED FROM A PROGRAM BY AR
T FLEXSER, MARCH 1986
40 '
50 'MODIFIES ASCII FILES BY DELE
TING THE LINEFEEDS
60 '
70 CLEAR 200,&H7DFF
80 FOR I=&H7E00 TO &H7E29: READ
P$:POKE I,VAL("&H"+P$): NEXT
90 DATA 8D,A,8D,1D,81,A,27,F8,8D
,9,20,F4,C6,1,D7,6F,7E,C5,97
100 DATA C6,2,D7,6F,AD,9F,A0,2,F
,6F,6E,9F,A0,2,D,70,27,4,F,6F
110 DATA 32,62,39
120 IF PEEK(&HC004)<>&HD6 THEN P
OKE &H7E12,&HC4 'For 1.1 ROM
130 CLS: PRINT: PRINT: PRINTTAB(
8)"LINEFEED STRIPPER": PRINT
140 LINEINPUT "NAME OF INPUT FIL
E: ";I$
150 LINEINPUT "NAME OF OUTPUT FI
LE: ";O$
160 OPEN "I",#1,I$
170 OPEN "O",#2,O$
180 EXEC &H7E00
190 CLOSE #2: CLOSE #1
200 END

```

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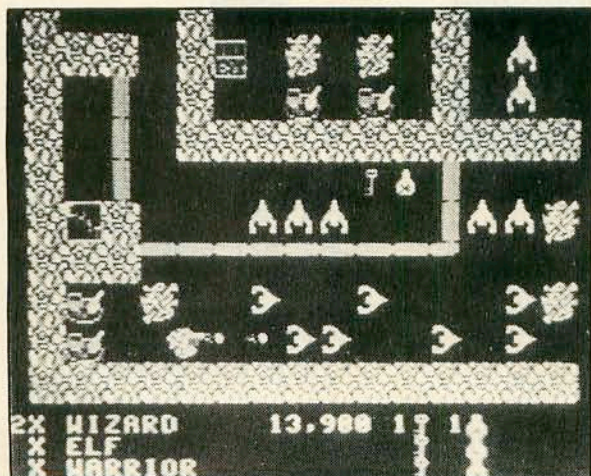


All of these programs carry the Rainbow Seal.



# NECOM PRODUCTS

## GANTELET

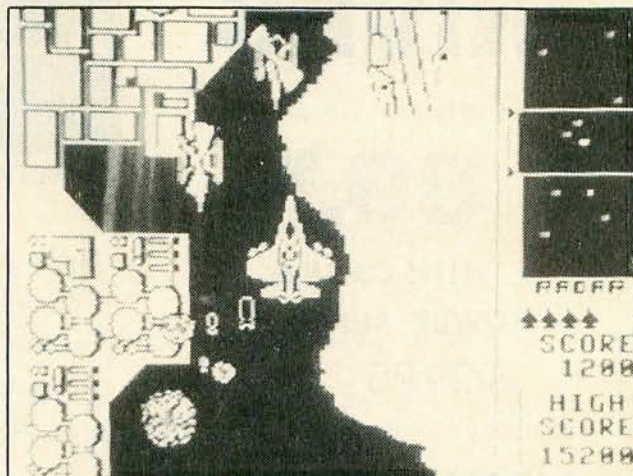


One, two or even three people can play Gantelet at the same time. You and your friends travel through the many levels in search of an exit to the next level. Avoid the Ghosts and other creatures that are out to stop you in your quest. Collect keys to open doors, treasures and magic potions to aid you in your battle. Watch out for hidden traps as you frantically search for the exit to the next level.

64 k required  
tape or disk

**\$28.95** U.S.  
**\$38.95** Can.

## Mission: F-16 ASSAULT

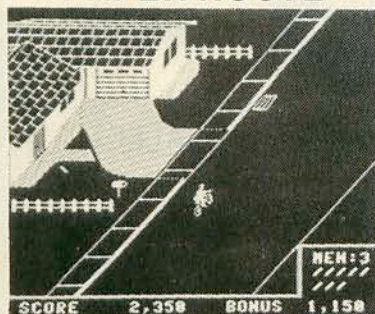


Fly your plane over land and water while avoiding enemy missiles, planes and helicopters attacking from the top and bottom of the screen. Use your radar to track objects as they approach the main screen. Bomb oil refineries, airports and destroy planes before they can take off from the airports. Watch out for missiles fired from hidden missile silos on the ground. Dozens of screens of detailed terrain plus increasing difficulty make this a great game for everyone.

64 k and joystick required  
tape or disk

**\$28.95** U.S.  
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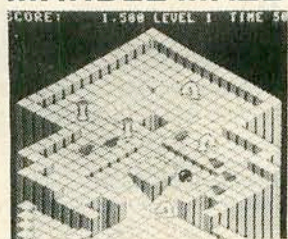
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64 k  
joystick required **\$28.95** U.S.  
tape or disk **\$38.95** Can.

## MARBLE MAZE

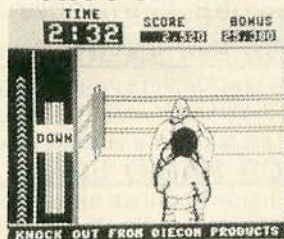


Move your marble around the mazes in your search for the finish line! Avoid marble eaters, acid puddles and other creatures that inhabit the mazes. Eight different levels and great graphics make this game a must for your collection.

joystick required

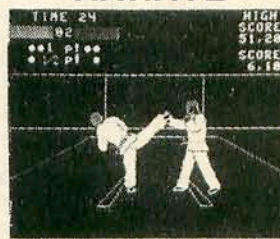
64 k required tape or disk **\$28.95** U.S. **\$38.95** Can.

## KNOCK OUT



Fight against five different boxers in this great boxing game! At first the boxers are easy to knock out, but beware, it gets harder as you move on. The boxers are out to stop you in your quest to become champion of the world. Outstanding graphics make this a must for your collection!

## KARATE



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joystick required

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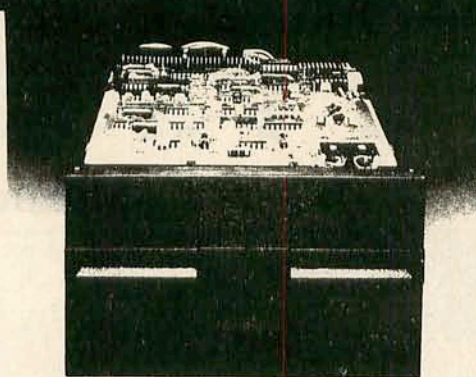
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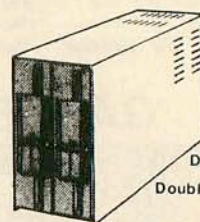
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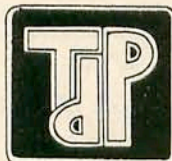
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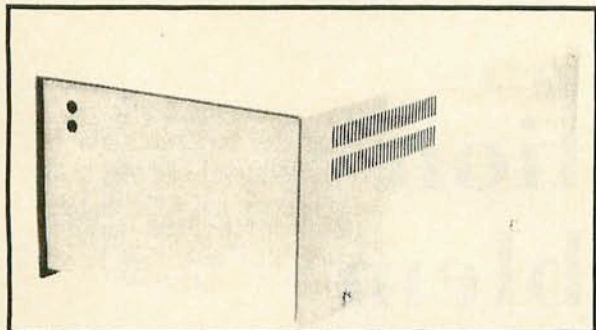
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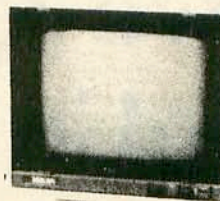
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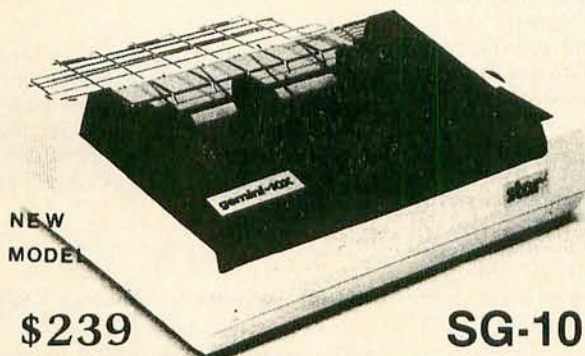
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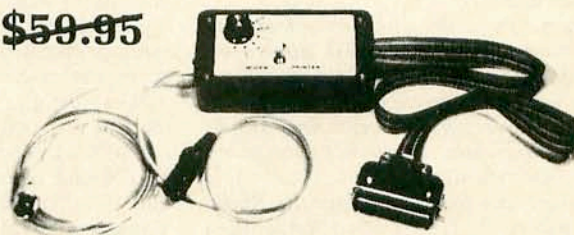
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# The Two-Question Two-CoCo Problem

By Dan Downard  
Rainbow Technical Editor

• I have two questions. My system consists of a CoCo 2 64K, a CoCo 1 NC board upgraded to 64K with dual Radio Shack disk drives (white cases) and their controller, a CMP-130 printer, a Modem I and a Radio Shack cassette recorder.

1) When I move the disk drives from my CoCo 2 to my CoCo 1, the disk directories display garbage and none of the programs will run, yet when I move the drives back to the CoCo 2 everything works fine. Could this have something to do with the clock speeds of the two CoCos?

2) Is there any way to transfer the Radio Shack Disk BASIC 1.1 ROM to RAM, then automatically print out all the memory locations to my printer? I have the Radio Shack EDTASM+ cartridge on disk using Roger Schrag's patch.

Dean Pace  
St. Peters, MO

Dan Downard is an electrical engineer and has been involved in electronics for 26 years through ham radio (K4KWT). His interest in computers began about seven years ago and he has built several 68XX systems.

Most of the people who write, Dean, have just the opposite problem with their disk drives. The older disk controllers will not work with the CoCo 2s due to the lack of 12 volts on the expansion port. As far as your problem is concerned, I suggest replacing the 6809E on your CoCo 1. I had the same problem once and replacing the microprocessor cured it.

As a sidelight, we have been informed that the new disk controllers from Tandy are not capable of reading single-density tracks. FLEX and some protection schemes read and write single-density data on Track 0. The new controllers will not work with this software.

To disassemble Disk BASIC all you need to do is return to the 32K mode by entering Z-BUG and changing memory location \$FFDE. This disables the 64K mode and you should be able to read the data directly from ROM. Use the Z-BUG command THC000 DF58. Make sure you are in the Hex input mode first by typing 116.

### A Hard Disk is Hard to Find

• I have Version 02.00.00 of OS-9. It is

compatible with either 15-megabyte or 35-megabyte hard disk drives. When I found out this information, I became interested in buying a hard disk drive. I searched through magazines and catalogs trying to find one and came up with nothing.

Could you please give me any information as to where I could find a 15M or 35M hard disk drive?

Andy Ellinor  
Odessa, FL

Andy, it just so happens that Tandy also sells 35-Meg hard drives. Maybe that's why the drivers are set up for these odd values. I'm sure that changing these parameters in the device descriptors will be addressed by one of our OS-9 advocates very shortly.

### Mixing Software and Memory Expansion

• I am considering installing more memory in my CoCo — 128K or 256K. There are several suppliers of these upgrades and I am concerned about their compatibility with software, that I believe, will eventually be available to use this memory. If I install one



of these upgrades will I be able to use software written for this amount of memory or will I have to have a certain "brand" of memory expansion?

What do you know of the progress being made on this software, such as spreadsheets, word processors or database managers?

David Kincaid  
Greenville, SC

David, you hit the crux of memory expansion when you bring up software. So far, I have seen no efforts in the fields you mention. Most memory upgrades come with RAM disk software. All this does is allow the increased memory to act as a super-fast disk drive.

Thunder RAM from Spectrum Projects comes with a built-in ROM using a system of machine language commands/entry points. It's called TDOS and it's a step in the right direction, but still does not easily facilitate the use of longer programs.

Personally, I can't envision a program too large to run on the CoCo if modular programming is used. Maybe the data will not fit in memory now; that is where a RAM disk helps. Just store all of your data in disk files that have fast access.

#### Terminal Adjustment for OS-9?

• I have an older 'D' board that was "piggybacked" up to 32K. How do I go about installing 64K so it can be used as a terminal in my OS-9 system? I can remove the 74LS02 and 138 and install sockets if that is necessary.

Bernie Beshers  
Ketchikan, AK

I assume you want a smart terminal, Bernie, since 32K is more than enough for a dumb terminal; 32K is more than enough for a smart terminal, as long as you don't mind a small buffer. What I am getting at is the fact that your terminal program does not have to operate under OS-9 to use it as a remote terminal for OS-9. There are several excellent terminal packages written for Disk BASIC that will do the job.

To modify a 'D' board I suggest obtaining a copy of the May 1984 RAINBOW. There is an article entitled "RAM/ROM Upgrade Roundup" by Ed Eilers [Page 49] that gives instructions for upgrading several types of boards, up to the earlier CoCo 2s.

If you buy your 64K chips from one of our advertisers, they will usually provide installation instructions with your order if requested. Be sure to mention the type of board you have.

#### No Hope for this Marriage

• Recently, I experimented with one of my

programs. I made a BASIC program that requires the use of a predrawn graphics screen. Every time I work with this program, I first have to load the BASIC program and then LOADM the graphics screen. I want only one program to load! I tried to SAVEM the program and graphics screen like this:

SAVEM"GRAPHS", 1536, 30000, 1536

When I loaded the program, I made a listing perfectly, but when I ran the program, the computer stopped and the listing became lines of garbage. What can I do to SAVEM and LOADM my BASIC program and graphics screen together?

Eric Bernatchez  
Quebec, Canada

Eric, loading a BASIC program also sets pointers in low RAM to tell CoCo where the program starts and stops. There are several methods of packing graphics into a BASIC program, but I would not advise them for extensive graphics usage. Just grin and bear it when you hear your drives purr.

#### The Secret of Cables and Pins

• I have a gray CoCo with two vertical disk drives. I also have acquired two additional Drive 0s I would like to use as Drives 2 and 3.

One of the best kept CoCo secrets seems to be the cable and pin function assignments and the disk drive addressing methods used by Radio Shack for the vertical drives. The local Radio Shack Service Center claims it cannot provide this information.

John McNeirney  
Madison, WI

John, the different drives are selected by a separate pin for each drive. The functions of all of the active pins between the controller and drives are as follows:

Pin	Signal
8	Index/sector
10	Drive select 1
12	Drive select 2
14	Drive select 3
16	Motor on
18	Direction select
20	Step
22	Write data
24	Write gate
26	Track 00
28	Write protect
30	Read data
32	Drive select 4

#### April Fresh CoCo

• I read in another magazine that if you combine fabric softener and water in a spray

bottle and spray it on the rug around your computer it will stop static electricity. Is this true or not?

Chris Romance  
Massapequa Park, NY

Chris, I heard a rumor to that effect, too, but I'm not a chemist. Maybe one of our readers can confirm this suggestion. It certainly works on your clothes!

#### Read My Memory

• I upgraded to 64K, added disk and Telewriter-64. Everything worked. I then prefixed ROMRAM to a program expecting more memory from MEM, but CoCo seemed stuck in 32K. How can I determine the true memory remaining in 64K regime? Is there a POKE? Or am I misusing ROMRAM?

R. Telford  
Surrey, British Columbia

Mike, there have been several articles written on this subject, but you are correct — just simply running ROMRAM does not give more memory. It just relocates your BASIC ROMs to RAM where they can be changed, moved, etc. I do think you have a bigger buffer with Telewriter-64 in 64K.

#### Prompt Printing

• I have a Radio Shack DMP-100 printer and I print out graphics pictures quite often. But, even when I print them out at 1200 Baud, it still takes a while for a complete picture to print out. Is there any way I can print at a faster speed? I've heard of a serial-to-parallel interface, but what does it do?

Matthew Coenen  
Norwalk, IA

Matthew, the only thing a serial-to-parallel converter does is speed up the data from your CoCo to the printer; it does not allow the printer to print any faster. Instead of sending data at 1200 Baud, you are able to send it at 9600 Baud.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

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## BARDEN'S BUFFER

## The Meaning of Life

By William Barden, Jr.  
Rainbow Contributing Editor

**T**he game I'm about to describe is more than a frivolous pastime. For some, it's a challenge in assembly language. For others, the key to unlocking the secrets of evolution. And for yet others, it's a way of generating interesting patterns. It's called "Life," and is an ancient computer game dating back at least 15 years.

Actually, it's not a game in the sense of a person versus computer confrontation. It's more a challenge of finding out how the game works and what the limits are, if any.

### The Rules of Life

The rules were laid out by the game's inventor, mathematician John Horton Conway. Martin Gardner, of *Scientific American's* "Mathematical Games" fame, introduced it in his October 1970 column and provided periodic updates for several years thereafter. For the most part, the descriptions I'm providing come from the *Scientific American*

*Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years experience in the industry covers a wide background: programming, systems analyzing and managing projects ranging from mainframes to microcomputers.*

columns. There's a recently published book on "Life" and other topics, called *The Recursive Universe* (William Poundstone, William Morrow and Company, 1985) that makes interesting reading.

The rules are deceptively simple. Start with a square matrix like a checkerboard. Each square of the checkerboard is called a cell. The checkerboard can be any width and any height, although something on the order of a CoCo screen (128 by 96) is a good size to start with. Put a pattern on the checkerboard by generating random points or entering points via a BASIC PSET command. The pattern defined is the starting generation.

Now consider each cell in the 128 by 96 matrix defined by the CoCo's screen. If a cell is on, it's considered to be living. Whether or not a cell survives until the next generation is dependent on its immediate neighbors, the eight cells adjacent to the living cell, as shown in Figure 1. We'll call the neighbors A, B, C, D, E, F, G, H and I.

If the living cell has no neighbors or one neighbor, it dies from loneliness and disappears in the next generation. If the cell has two or three neighbors, it survives until the next generation. If the cell has more than three neighbors, it dies from overcrowding.

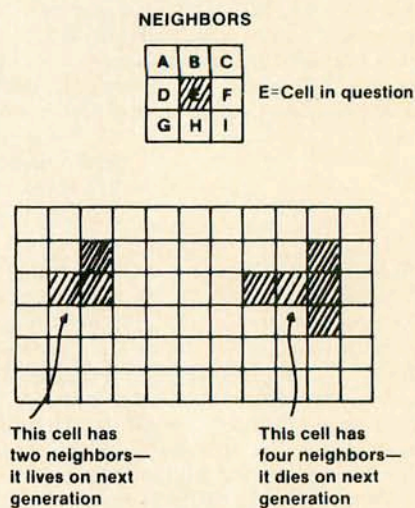


Figure 1: Neighboring Cells

Not only can cells die, but new cells can be born. If an empty cell has three neighbors, the neighbors produce a new cell in the next generation. This only happens if an empty cell exists and there are three of the possible neighbors A, B, C, D, F, G, H and I.

Each generation is produced using these simple rules and there are an unlimited number of generations.

Here's an example. Start with a simple pattern such as the three cells in a straight line, as shown in Figure 2. The



result in generation one is a straight line of three cells at right angles to the first line. This pattern flips back and forth, oscillating in a style reminiscent of a blinker. To "Life" devotees, the pattern is called a blinker.

tiful designs but die off after a dozen generations or so. Figure 3 shows the tenth generation of a "Life" game generated from 1,400 initial random points, grouped towards the screen center.

allows 4,096 by 4,096 cells to be displayed at one time. As a matter of fact, a dedicated system has been built to run "Life" at high-speed so the patterns can be observed and cataloged. Bear in mind this is not a project that is a profound breakthrough in artificial intelligence — it is primarily a fun thing that has some interesting implications. Still, "Life" has a large following.

#### A BASIC Life

Listing 1 shows "Life" implemented in BASIC. This BASIC program uses only a 14 by 20 element portion of the screen since BASIC is decidedly slow in producing the next generation. To use this program, enter a number for 'X' from zero to 19 and a number for 'Y' from zero to 13 to define the pattern, and watch the computation. It takes about 52 seconds to produce the next generation. The blinker pattern is defined by entering:

```
10,6
10,7
10,8
-1,-1
```

The two "-1" values terminate the entry and start "Life" processing.

#### An Assembly Language Life

A 14 by 20 matrix is really not big enough to see the interaction of the different patterns. The point of this column is a full-blown CoCo assembly language program to generate a 128 by 96 single-color version of "Life" on the CoCo (see Listing 2). Using the assembly language program, each generation of "Life" takes about 6.7 seconds. Still slow, but fast enough so you can easily watch the progress from generation to generation. I decided to use the lower resolution PMODE 0, instead of the maximum resolution PMODE 4, which requires four times the computation because there are four times the number of pixels.

#### The Program Algorithm

Having been through several versions of "Life" on different systems, I knew the program could never be fast enough. For that reason, I gave a lot of thought as to how the program should be implemented.

The first design consideration was the graphics screen. The graphics screen in Disk BASIC starts at location \$E00, as shown in Figure 4. If PMODE 0 is used, the resolution of the screen is 128 pixels wide by 96 pixels high. In PMODE 0 and in every single-color graphics mode, one

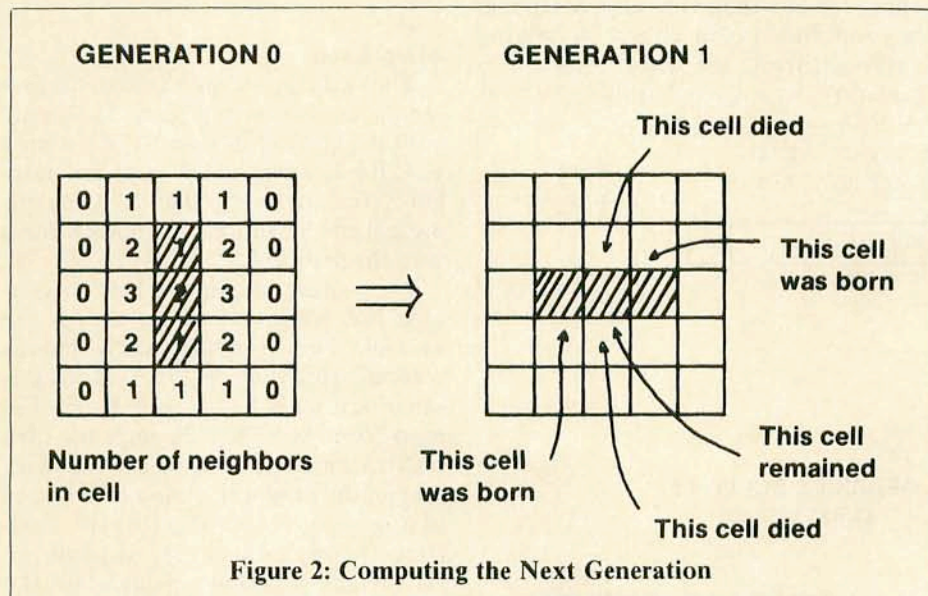


Figure 2: Computing the Next Generation

#### The Appeal of Life

The interesting thing about "Life" is the unpredictability of the patterns produced. Start with a completely random pattern generated by:

```
1000 PMODE 4,1
1100 SCREEN 1,0
1200 FOR I=1 TO 1400
1300 PSET(RND(256),RND(192))
1400 NEXT I
```

and apply the rules of "Life." You'll wind up with a situation analogous to life oozing up out of the primordial slime — a random pattern that produces some organisms that stay around forever and others that produce beau-

tiful designs but die off after a dozen generations or so. Figure 3 shows the tenth generation of a "Life" game generated from 1,400 initial random points, grouped towards the screen center.

#### A High-Speed Life Generator

To study "Life," programmers and computer scientists use large mainframe computers and displays. One display

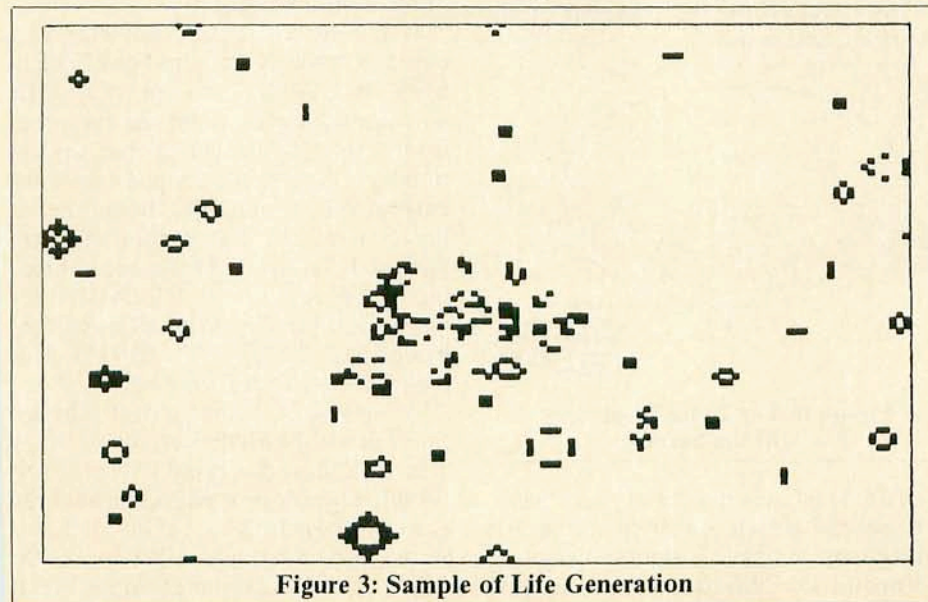


Figure 3: Sample of Life Generation



bit is used to store the color for each pixel. A '1' in the bit means the foreground color is used; a '0' bit means the background color is used. Therefore, in PMODE 0 there's a total of 128 pixels/row x 96 rows = 12,288 pixels = 12,288 bits.

Of course, there are eight bits in a byte, so 12,288 bits/(8 bits/byte) = 1,536 bytes used to store each graphics screen.

last row and ending on the first row, as shown in Figure 5.

One other screen design consideration was what is to be done on the screen boundaries. There are two approaches to handling boundary conditions. One approach lets the living cells disappear beyond the screen edges. A second approach treats the whole screen as a "toroid" — a closed universe — as

appear almost immediately, avoiding a slow, partial screen update.

The program is divided into three parts: a main loop, a Count Neighbors subroutine and a Get Address subroutine.

### Main Loop

The main loop scans through the first screen as shown in Figure 5, starting with the last cell in Row 95 of Column 127. Rows are called 'Y' and are numbered from zero through 95. Columns are called 'X' and are numbered from zero through 127.

The current location is held in variable XY. Note that this is a two-byte variable. The first byte holds 'X' and the second byte holds 'Y'. This variable is initialized with X=127 and Y=95. The loop from MAN005 through the fifth instruction after MAN080 is the main loop of the program, done 128\*96 times to process each of the 12,288 cells. Each time through the loop, subroutine GETADD is called to calculate the addresses for the current XY. This is followed by a call to subroutine COUNTN to count the neighbors of the current cell.

After the call to COUNTN, a check is made of the current cell's on/off status. The byte location of the current cell is held in ELOC, a 16-bit pointer set by GETADD. The bit position of the cell within the byte is held by EBIT, an eight-bit variable set by GETADD. A branch is made to MAN040 if the cell is empty.

If the cell is empty, a check of variable COUNT (set by COUNTN) is made. If COUNT=three, the code at MAN010 is called for the "birth." If COUNT<three, nothing is done.

If the current cell is not empty, a check is made of the number of neighbors. If COUNT=two or three, the corresponding cell in the second screen is set, otherwise the cell is reset. Again, pointer ELOC holds the address of the current cell, while EBIT holds the bit position of the cell within the byte retrieved. Variable EBITI is the inverted bit of the cell, set by GETADD. For example, if the current bit is represented by 0010000, EBITI holds 1101111. This makes it easy to reset the bit.

At the end of the birth/death checks, the code at MAN080 decrements 'X' by one. If 'X' does not equal 11111111 (off the left edge of the screen), the next cell is considered. If 'X' is 11111111, 127 is stored in the first byte of XY for the 'X' value, and 'Y' is decremented by one. If

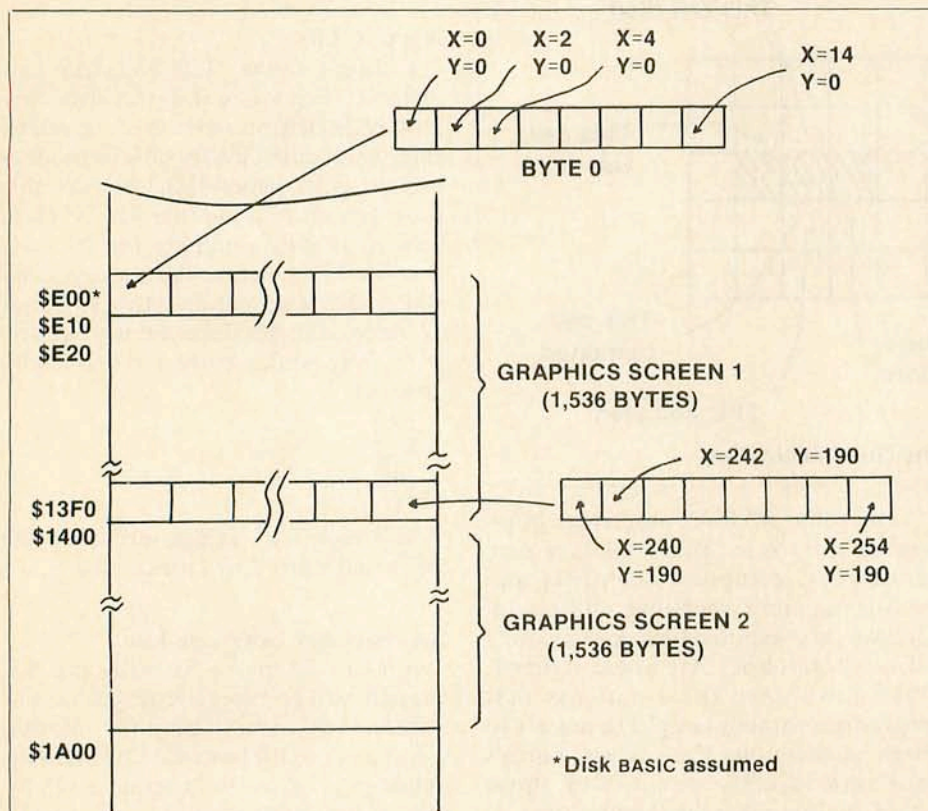


Figure 4: Memory Layout for PMODE 0

The plan I use is to keep the PMODE 0,1 screen as the current screen and update a second screen, the PMODE 0,2 screen. (In the PMODE command, the second parameter specifies the page number, in this case '1' or '2'.)

To do this, I have it scan the current screen one cell (pixel) at a time. For each cell, a count of the neighbors is made, with the corresponding cell in the new screen set or reset according to the rules of "Life." The scan proceeds from right to left across each row, starting at the

shown in Figure 6. The second approach is followed here. Patterns going off the right reappear on the left, patterns going off the top reappear on the bottom, and so forth.

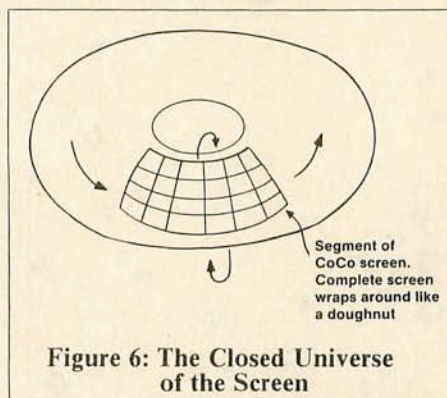


Figure 6: The Closed Universe of the Screen

After each screen scan of 12,288 cells, the second screen is written to the first screen by a quick assembly language subroutine. This makes the update

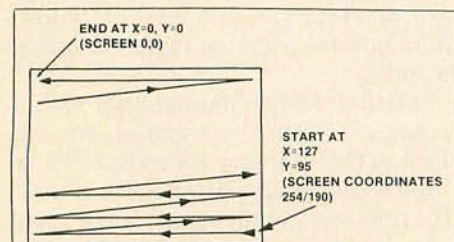


Figure 5: Scanning the Current Page



'Y' is not equal to 1111111, the next row above is considered.

When the 'Y' value is decremented down to 1111111, the last row has been processed and the new cells are in the second screen. The data in screen two is moved to screen one by the short move code starting near MAN085. This code is so fast the entire screen appears to change, even though the movement is done from top to bottom, a row at a time.

### Count Neighbors Subroutine

This subroutine counts the eight neighbors of the current cell. The result is COUNT, which holds a value of zero through eight and is used in the main loop to determine whether the cell lives or dies. The subroutine uses two tables. One of the tables starts at ALOC and is the byte location table. This table is established by the GETADD subroutine and holds the byte address of each of the neighbors of the current cell, the neighbors being the cell up and to the left, directly above, up and to the right, the cell directly left, and so forth.

The second table starts at ABIT and holds the bit configuration that defines the neighbor bit within the byte pointed to by the ALOC table. For example, if the current cell is defined by 00010000, the neighbor to the left is defined by 00100000 and the neighbor to the right by 00001000.

The Count Neighbors subroutine goes down through both tables, using the ALOC table entry to point to the byte containing the cell and the ABIT table entry to strip off the proper bit, which is counted if it is a one. The current cell is defined by ELOC and EBIT, and is beyond the end of both tables so that the subroutine only counts neighbors.

### Get Address Subroutine

Most of the work in the program is done by the Get Address subroutine. It establishes the addresses in the ALOC table and the bit positions in the ABIT table. The graphics data for all 128 by 96 bits, remember, is represented by one bit somewhere within the 1,536 bytes of screen one. The first byte represents Y=0 and X's of 0, 1, 2, 3, 4, 5, 6 and 7; the next byte represents Y=0 and X's of 8, 9, 10, 11, 12, 13, 14 and 15, and so on.

The subroutine locates the byte containing the current X,Y by multiplying the 'Y' value by 16, as there are 16 bytes per row. The 'X' value is then divided by eight and added to the Y\*16 value.

Eight is used as a divisor because there are eight cells per byte. The division is done by three consecutive shifts — it's equivalent to a BASIC INT function. The actual address in screen one is then computed by adding \$E00 to  $Y*16 + \text{INT}(X/8)$ . This byte address is stored in DLOC, ELOC and FLOC the table locations for the current X,Y and its two neighbors on the same row.

The ALOC, BLOC, and CLOC locations in the preceding row can be found by subtracting 16 from the locations for the current row. The result is put into the three table entries. Similarly, the GLOC, HLOC and ILOC locations are found by adding 16 to the current row locations.

These table entries are valid providing one of the three rows isn't off the top or bottom (or another condition, which we'll discuss shortly). Checks are made for this, and 1,536 is either added or subtracted from the row to point to the wrap-around row from the other side of the screen, which gives the toroidal effect.

The code from location GET022 is used to compute and store the bit position within the byte to be accessed by the ALOC entry. This location is determined by the three least significant bytes of 'X'. If  $X = \text{XXXXX000}$ , for example, the bit position is 10000000; if  $X = \text{XXXXX001}$ , the bit position is 01000000, and so forth, up to  $X = \text{XXXXX111}$ , where the bit position is 00000001.

The cell mask values are contained within a cell mask table at location MASK. The entries in ABIT are initialized such that the current 'Y' values (B, E and H) get the mask table value, the 'Y' locations to the left get the bit position values with the bit shifted left one bit, and the Y locations to the right get the bit position values with the bit shifted right one bit. If the bit position for the current cell is 00010000, for example, ABIT, DBIT and GBIT get 00100000, and CBIT, FBIT and IBIT get 00001000.

The last part of the GETADD subroutine adjusts the ALOC table for the boundary conditions in cases where either the current 'Y' involves two bytes or the edge of the screen (left or right) has been encountered. If the current 'Y' is at the left bit of a byte, for example, the bit mask is 10000000. The left neighbor's bit mask is 00000001 in this case (the right neighbor's bit mask is 01000000).

This means the left neighbor's byte location should be one less than the

location stored. This check is made and the byte location adjusted in the two cases where the current 'Y' is at either end of the byte. A check is also made for the left and right edges, and 15 is added or subtracted to get the proper wrap-around byte in this case.

To avoid computing addresses for every X,Y, the byte address calculation is done only for X's that represent a bit at either the left or right end of the byte. These are the only cases where two bytes are involved. If the bit is in bit position one (01000000) through five (00000101), the prior ALOC addresses apply, and the address portion of GETADD is skipped at the beginning of the subroutine. The effect is to speed up the

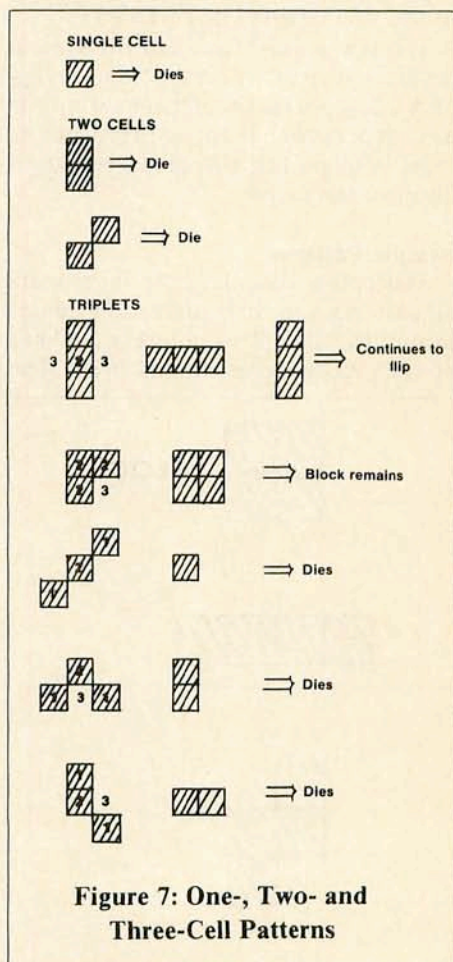


Figure 7: One-, Two- and Three-Cell Patterns

subroutine for two-thirds of the cells, knocking about 14 percent off the screen update rate.

### A BASIC Driver

Listing 3 shows the BASIC driver program that implements the assembly language "Life" program. It has the assembly language machine language code embedded in it as a series of DATA values. The DATA values are relocated to the &H3E00 area by a POKE loop before the program is executed.



The BASIC driver has provision for either entering a set of points for the initial "Life" pattern, or for generating a number of random points at the screen center. To enter a set of points, enter 'S' after the USER PNTS (S) OR RANDOM (R)? prompt message.

The program then asks for the X,Y position of the point: X,Y? Enter as many X,Y values as you want, and enter -1,-1 to terminate the entry. The X,Y points *must* be even numbers due to the half resolution of PMODE 0. For example, adjacent points are 100/100, 100/102 and 100/104.

To use a set of random points, enter R after the Set/Random message. The program asks for the number of points to use: NUMBER OF POINTS?

Too few points here, and the second generation virtually disappears, leaving only a few points that disappear on the next generation. If the entire screen is filled with points, the next generation disappears entirely.

### Sample Patterns

You could systematically investigate all patterns and their succeeding generations in "Life," — much work has already been done in this area. The

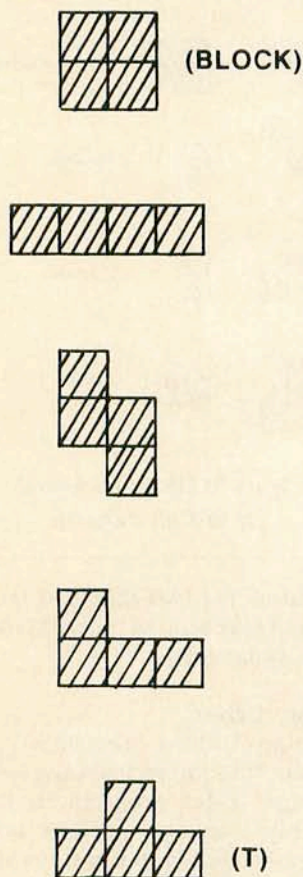


Figure 8: The Five Tetrominoes

simplest pattern is a single cell (Figure 7), which dies in the next generation from loneliness. The next simplest patterns are two adjacent cells, either horizontally, vertically or diagonally. These also die in the next generation.

The next set of patterns are triplets. There are five ways in which three cells can be combined, as shown in Figure 7. Since the L-shape cells have two neighbors, they endure until the next generation. In addition, the cell in the nook of the 'L' is born. The resulting block is a stable life form — what Conway calls a still life — it never changes. We've seen the three cells in a straight line before; they change to a line at right angles on the next generation, a so-called blinker. The blinker flips back and forth from generation to generation. The other configurations die after one generation.

The next set of cells are made of four cells connected together. The game's jargon for these patterns is "tetromino," tetra meaning four. There are five ways that four cells can be connected, as shown in Figure 8. The block configuration is stable, as we've seen. The 'T' tetromino looks as if it will grow larger and larger, but stabilizes after nine generations into a "traffic light," a series of four blinkers.

The straight line tetromino turns into a block of six cells on the next generation, which in turn creates a "beehive," another unchanging pattern. The two remaining tetrominoes also produce beehives.

So far, "Life" isn't too exciting, but we've only considered four sets of

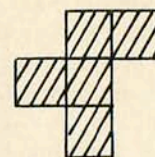


Figure 9: The R Pentomino

patterns. There is an infinite number to go!

The next set of patterns is formed by connecting five cells, "pentomino" shapes. One of the most interesting of these is the 'R' pentomino, shown in Figure 9. The 'R' pentomino seems to grow without bound, scattering debris all over the screen. However, after dozens of generations in our toroidal universe, the life forms settle down to simple patterns that are either still life or blinkers. An intermediate screen is shown in Figure 10.

### Ah, Sweet Mystery of Life

Is there any configuration of cells that grows without bound, forever? Experimentation in this area produces a shape known as a glider. It glides across the screen (Figure 11). The glider can be generated by a glider gun, a complex arrangement of patterns that goes on producing gliders forever. (It's also seen in the 'R' pentomino patterns.) There are other patterns that replicate themselves as well.

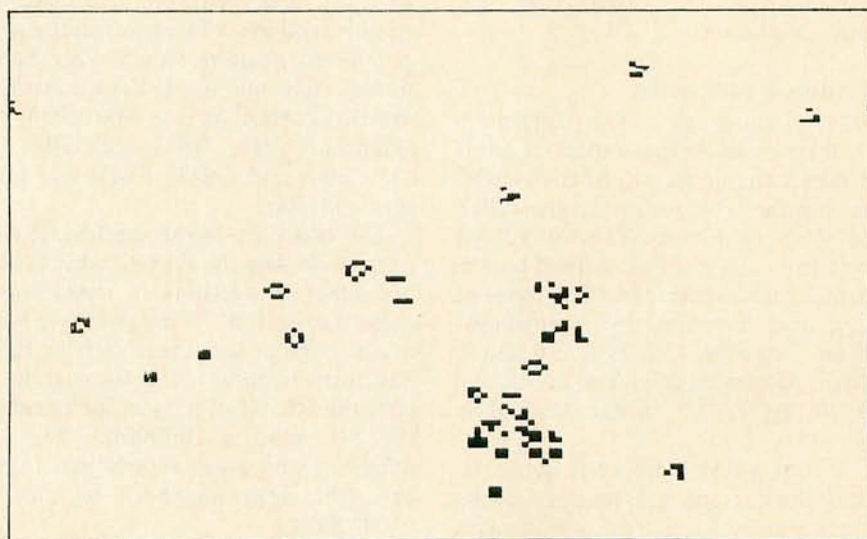


Figure 10: R Pentomino Patterns



It's a lot of fun to start with a pattern of your own design (you can do this by slightly altering the BASIC program) and watch what happens. At the very least, you'll see generations of interesting "Life" forms.

For more reading on this, get Poundstone's book or try to get the original *Scientific American* articles. For help, contact me at P.O. Box 3568, Mission Viejo, CA 92692.

Next month I'll be back with more assembly language topics. In the meantime, keep assembling! □

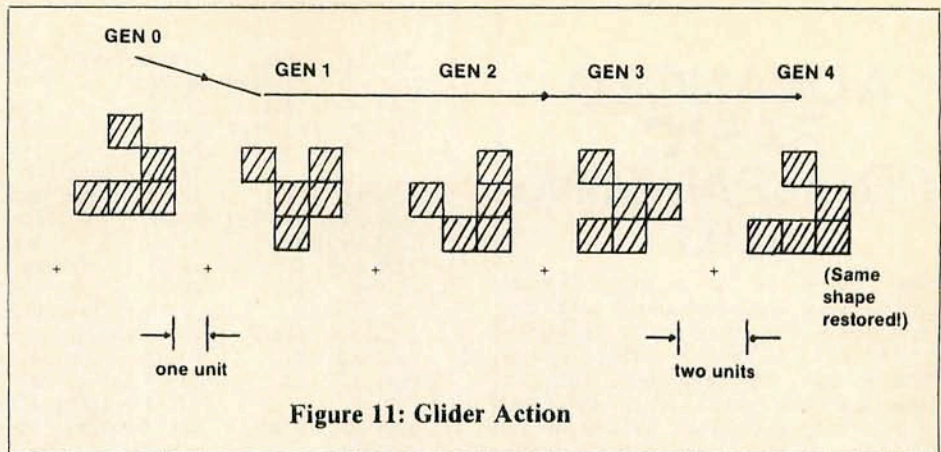


Figure 11: Glider Action

#### Listing 1: SLOWLIFE

```

100 'RUDIMENTARY LIFE 20 X 14
110 DIM A(13,19)
120 'CLEAR ARRAY
130 FOR Y=0 TO 13:FOR X=0 TO 19
140 A(Y,X)=32
150 NEXT X: NEXT Y
160 CLS
170 'READ IN INITIAL VALUES
180 PRINT@448,"";
190 INPUT "X,Y:";X,Y
200 IF X=-1 THEN 240 ELSE PRINT
   @Y*32+X,"O";: A(Y,X)=79
210 PRINT@452,"";
220 GOTO 180
230 'MAIN LOOP
240 FOR Y=0 TO 13: FOR X=0 TO 19
250 XL=X-1: IF XL=-1 THEN XL=19
260 XP=X+1: IF XP=20 THEN XP=0
270 YL=Y-1: IF YL=-1 THEN YL=13
280 YP=Y+1: IF YP=14 THEN YP=0
290 'FIND # OF NEIGHBORS
300 NO=0
310 IF PEEK(&H4000+YL*32+XL) <> 96
   THEN NO=NO+1
320 IF PEEK(&H4000+YL*32+X) <> 96
   THEN NO=NO+1
330 IF PEEK(&H4000+YL*32+XP) <> 96
   THEN NO=NO+1
340 IF PEEK(&H4000+Y*32+XL) <> 96
   THEN NO=NO+1
350 IF PEEK(&H4000+Y*32+XP) <> 96
   THEN NO=NO+1
360 IF PEEK(&H4000+YP*32+XL) <> 96
   THEN NO=NO+1
370 IF PEEK(&H4000+YP*32+X) <> 96
   THEN NO=NO+1
380 IF PEEK(&H4000+YP*32+XP) <> 96
   THEN NO=NO+1
390 IF PEEK(&H4000+Y*32+X) <> 96
   THEN IF NO=2 OR NO=3
     THEN A(Y,X)=79 ELSE A(Y,X)=
       32: GOTO 410
400 IF NO=3 THEN A(Y,X)=79
410 NEXT X: NEXT Y
420 'PRINT NEXT GENERATION
430 FOR Y=0 TO 13: FOR X=0 TO 19
440 PRINT@Y*32+X,CHR$(A(Y,X));
450 NEXT X: NEXT Y
460 GOTO 240

```

#### Listing 2: FASTLIFE

```

00100 *****
00110 * HIGH-SPEED LIFE IN 128 BY 96 PIXELS *
00120 *****
00130 *
00140 * MAIN LOOP
00150 *
00160 ORG $3E00
00170 LDD #127*256+95
00180 STD XY INITIALIZE X,Y
00190 LDD XY GET X,Y
00200 LBSR GETADD FIND ALL ADDRESSES
00210 BSR COUNTN COUNT NEIGHBORS
00220 LDA [ELOC] GET BYTE
00230 ANDA EBIT GET CELL
00240 BEQ MAN040 GO IF EMPTY
00250 * LIVING CELL HERE
00260 LDA COUNT GET COUNT
00270 ANDA #00E THIS TRICK
00280 EORA #2 TESTS FOR 2 OR 3
00290 BEQ MAN010 GO IF 2 OR 3
00300 * ON AND NOT 2 OR 3

```



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```

3E20 BE 3F76 00310 MANG07 LDX ELOC POINT TO BYTE
3E23 A6 89 0600 00320 LDA 1536,X GET BYTE FROM NEXT
3E27 B4 3F81 00330 ANDA EBITI RESET BIT - DEATH!
3E2A A7 89 0600 00340 STA 1536,X STORE BYTE
3E2E 20 17 00350 BRA MANG08 GO FOR NEXT CELL

00360 * ON AND 2 OR 3
3E30 BE 3F76 00370 MANG10 LDX ELOC POINT TO BYTE
3E33 A6 89 0600 00380 LDA 1536,X GET BYTE
3E37 BA 3F80 00390 ORA EBIT BIRTH OR STAY ALIVE
3E3A A7 89 0600 00400 STA 1536,X STORE BYTE
3E3E 20 07 00410 BRA MANG08 GO TO NEXT GEN

00420 * EMPTY HERE
3E40 B6 3F82 00430 MANG40 LDA COUNT GET COUNT
3E43 81 03 00440 CMPA #3 TAKES 3 TO TANGO
3E45 27 E9 00450 BEQ MANG10 GO IF BIRTH!

00460 * PREPARE FOR NEXT CELL
3E47 7A 3F83 00470 MANG08 DEC XY DECREMENT X
3E4A 2A BA 00480 BPL MANG05 GO IF 000 - $7F
3E4C 86 7F 00490 LDA #127 RESET X
3E4E B7 3F83 00500 STA XY STORE IN X
3E51 7A 3F84 00510 DEC XY+1 DECREMENT Y
3E54 2A B0 00520 BPL MANG05 GO IF 000 - $60
3E56 8E 0E00 00530 LDX #000 POINT TO PAGE 1
3E59 108E 1400 00540 LDY #000+1536 POINT TO PAGE 2
3E5D EC A1 00550 MANG85 LDD ,Y++ GET WORD
3E5F ED 81 00560 STD ,X++ STORE IN PAGE 1
3E61 8C 1400 00570 CMPX #000+1536 AT END?
3E64 26 F7 00580 BNE MANG85 GO OF NO
3E66 39 00590 RTS RETURN TO BASIC
00600 *****

00610 * COUNT NEIGHBORS SUBROUTINE *
00620 *****
3E67 5F 00630 COUNTN CLRB SET COUNT TO 0
3E68 8E 3F66 00640 LDX #ALOC POINT TO TABLE START
3E6B 108E 3F78 00650 LDY #ABIT POINT TO TABLE START-1
3E6F A6 91 00660 CNT005 LDA [,X++] GET BYTE WITH CELL
3E71 A4 A0 00690 ANDA ,Y+ TEST BIT
3E73 27 01 00700 BEQ CNT010 GO IF NO CELL
3E75 5C 00710 INCB BUMP COUNT
3E76 8C 3F76 00720 CNT010 CMPX #ILOC+2 AT END OF TABLES?
3E79 26 F4 00730 BNE CNT005 GO IF NO
3E7B F7 3F82 00740 STB COUNT STORE COUNT
3E7E 39 00750 RTS RETURN
00760 *****
00770 * GET ADDRESS SUBROUTINE. GETS NINE ADDRESSES*
00780 *****
3E7F 34 02 00790 GETADD PSHS A SAVE X
3E81 84 07 00800 ANDA #7 TEST BITS
3E83 27 06 00810 BEQ GET015 GO IF 000
3E85 84 06 00820 ANDA #6 IGNORE LSB
3E87 88 06 00830 EORA #6 TEST FOR 110 OR 111
3E89 26 44 00840 BNE GET022 BYPASS LOC COMP IF 001-101
3E8B 86 10 00850 GET015 LDA #16 16 BYTES PER ROW
3E8D 3D 00860 MUL 16*Y
3E8E 1F 01 00870 TFR D,X FOR NEXT ADD
3E90 E6 E4 00880 LDB ,S GET X
3E92 54 00890 LSRB X/2
3E93 54 00900 LSRB X/4
3E94 54 00910 LSRB X/8
3E95 3A 00920 ABX 16*Y+INT(X/8)=DISP
3E96 30 89 0E00 00930 LEAX $E00,X $E00+16*Y+INT(X/8)
3E9A BF 3F6C 00940 STX DLOC CURRENT ROW
3E9D BF 3F76 00950 STX ELOC
3EA0 BF 3F6E 00960 STX FLOC
3EA3 1F 10 00970 TFR X,D FOR COMPUTATIONS
3EA5 83 0010 00980 SUBD #16 FOR PREV ROW - MAY BE MODS
3EA8 1083 0E00 00990 CMPD #000 ABOVE TOP?
3EAC 24 03 01000 BHS GET011 GO IF NO
3EAE C3 0600 01010 ADDD #1536 WRAP AROUND FROM BOTTOM
3EB1 FD 3F66 01020 GET011 STD ALOC PREVIOUS ROW
3EB4 FD 3F68 01030 STD BLOC
3EB7 FD 3F6A 01040 STD CLOC
3EBA C3 0020 01050 ADDD #32 FOR NEXT ROW
3EBD 1083 13FF 01060 CMPD #000+1535
3EC1 23 03 01070 BLS GET020 GO IF NOT OFF BOTTOM
3EC3 83 0600 01080 SUBD #1536 WRAP AROUND FROM TOP
3EC6 FD 3F70 01090 GET020 STD GLOC NEXT ROW
3EC9 FD 3F72 01100 STD HLOC
3ECC FD 3F74 01110 STD ILOC
3ECF 35 04 01120 GET022 PULS B GET X
3ED1 C4 07 01130 ANDB #7 0-7

```



3ED3 8E	3F5D	01140	LDX	#MASK	MASK TABLE ADDR
3ED6 3A		01150	ABX		POINT TO MASK
3ED7 A6	84	01160	LDA	,X	GET MASK
3ED9 B7	3F79	01170	STA	BBIT	CURRENT COLUMN
3EDC B7	3F80	01180	STA	EBIT	
3EDF B7	3F7E	01190	STA	HBIT	
3EE2 43		01200	COMA		GET INVERTED BITS
3EE3 B7	3F81	01210	STA	EBITI	SAVE FOR RESET BIT
3EE6 A6	1F	01220	LDA	-1,X	GET LEFT MASK
3EE8 B7	3F78	01230	STA	ABIT	PREVIOUS COLUMN
3EEB B7	3F7B	01240	STA	DBIT	
3EEE B7	3F7D	01250	STA	GBIT	
3EF1 A6	01	01260	LDA	+1,X	GET RIGHT MASK
3EF3 B7	3F7A	01270	STA	CBIT	NEXT COLUMN
3EF6 B7	3F7C	01280	STA	FBIT	
3EF9 B7	3F7F	01290	STA	IBIT	
		01300	* POSSIBLE ADJUST OF LOC'NS ON BOUNDARIES		
3EFC B6	3F78	01310	LDA	ABIT	GET LEFT MASK
3EFF 81	01	01320	CMPS	#1	IS IT LSB?
3F01 26	29	01330	BNE	GET030	GO IF NO
		01340	* TWO-BYTE CASE HERE		
3F03 8E	0000	01350	LDX	#0	FINAGLE FACTOR
3F06 F6	3F67	01360	LDB	ALOC+1	GET BYTE LOC'N LSB
3F09 C4	0F	01370	ANDB	#0F	16-BYTE BOUND
3F0B 26	03	01380	BNE	GET025	GO IF NOT OFF LEFT
3F0D 30	88 10	01390	LEAX	+16,X	OFF EDGE
3F10 30	1F	01400	LEAX	-1,X	ADJUST IN EITHER CASE
3F12 34	10	01410	PSHS	X	STORE FOR COMPUTATION
3F14 FC	3F66	01420	LDD	ALOC	ADJUST LEFT LOC'NS
3F17 E3	E4	01430	ADDD	,S	
3F19 FD	3F66	01440	STD	ALOC	
3F1C FC	3F6C	01450	LDD	DLOC	
3F1F E3	E4	01460	ADDD	,S	
3F21 FD	3F6C	01470	STD	DLOC	
3F24 FC	3F70	01480	LDD	GLOC	
3F27 E3	E1	01490	ADDD	,S++	
3F29 FD	3F70	01500	STD	GLOC	
3F2C B6	3F7A	01510	GET030	LDA	CBIT
3F2F 2A	2A	01520	BPL	GET040	GO IF NOT \$00 CASE
		01530	* TWO-BYTE CASE HERE		
3F31 8E	0000	01540	LDX	#0	FINAGLE FACTOR
3F34 F6	3F6B	01550	LDB	CLOC+1	GET BYTE LOC'N LSB
3F37 C4	0F	01560	ANDB	#0F	16-BYTE BOUNDARY
3F39 C1	0F	01570	CMPS	#0F	TEST FOR OFF RIGHT
3F3B 26	02	01580	BNE	GET035	GO IF NOT OFF
3F3D 30	10	01590	LEAX	-16,X	OFF EDGE
3F3F 30	01	01600	LEAX	+1,X	ADJUST IN EITHER CASE
3F41 34	10	01610	PSHS	X	STORE FOR CALCULATIONS
3F43 FC	3F6A	01620	LDD	CLOC	ADJUST RIGHT EDGE LOC'NS
3F46 E3	E4	01630	ADDD	,S	
3F48 FD	3F6A	01640	STD	CLOC	
3F4B FC	3F6E	01650	LDD	FLOC	
3F4E E3	E4	01660	ADDD	,S	
3F50 FD	3F6E	01670	STD	FLOC	
3F53 FC	3F74	01680	LDD	ILOC	
3F56 E3	E1	01690	ADDD	,S++	
3F58 FD	3F74	01700	STD	ILOC	
3F5B 39		01710	GET040	RTS	RETURN
		01720	* CELL MASK TABLE		
3F5C	01	01730	FCB	1	
3F5D	00	01740	MASK	FCB	128
3F5E	40	01750	FCB	64	
3F5F	20	01760	FCB	32	
3F60	10	01770	FCB	16	
3F61	08	01780	FCB	8	
3F62	04	01790	FCB	4	
3F63	02	01800	FCB	2	
3F64	01	01810	FCB	1	
3F65	00	01820	FCB	128	
		01830	* BYTE LOCATION TABLE		
		01840	* A*B*C		
		01850	* D*E*F		
		01860	* G*H*I		
3F66	0000	01870	ALOC	FDB	0
3F68	0000	01880	BLOC	FDB	0
3F6A	0000	01890	CLOC	FDB	0
3F6C	0000	01900	DLOC	FDB	0
3F6E	0000	01910	FLOC	FDB	0
3F70	0000	01920	GLOC	FDB	0
3F72	0000	01930	HLOC	FDB	0
3F74	0000	01940	ILOC	FDB	0

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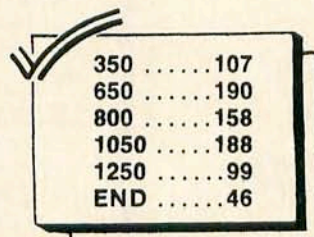
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MAKE CHECKS PAYABLE TO E.D.C.



3F76	gggg	01950 ELOC	FDB	0	
		01960 * MASK TABLE FOR NEIGHBORS			
3F78	gg	01970 ABIT	FCB	0	
3F79	gg	01980 BBIT	FCB	0	
3F7A	gg	01990 CBIT	FCB	0	
3F7B	gg	02000 DBIT	FCB	0	
3F7C	gg	02010 FBIT	FCB	0	
3F7D	gg	02020 GBIT	FCB	0	
3F7E	gg	02030 HBIT	FCB	0	
3F7F	gg	02040 IBIT	FCB	0	
3F80	gg	02050 EBIT	FCB	0	
3F81	gg	02060 EBITI	FCB	0	INVERTED BITS
		02070 * WORKING VARIABLES			
3F82	gg	02080 COUNT	FCB	0	COUNT OF NEIGHBORS
3F83	gggg	02090 XY	FDB	0	CURRENT X,Y
	gggg	02100	END		

ggggg TOTAL ERRORS



350 .....107  
650 .....190  
800 .....158  
1050 .....188  
1250 .....99  
END .....46

### Listing 3: DRIVER

```

100 ' HIGH-SPEED LIFE BASIC DVR
110 CLEAR 200,&H3DFF
120 FOR I=&H3E00 TO &H3F65
130 READ A: POKE I,A
140 NEXT I
150 DEFUSR = &H3E00
160 DIM PT(400)
170 CLS
180 PRINT @15,"LIFE"
190 INPUT "USER PNTS (S) OR
    RANDOM (R)";A$
200 IF A$="S" THEN 270
210 INPUT "NUMBER OF POINTS";NP
220 FOR I=1 TO NP
230 PT(I)=(100+RND(56))*256+85+
    RND(36)
240 NEXT I
250 I=I-1
260 GOTO 360
270 I=0
280 PRINT"ENTER X,Y(-1=END)"
290 PRINT@448,"X,Y";
300 INPUT X,Y
310 IF X=-1 THEN 360
320 PT(I+1)=X*256+Y
330 I=I+1
340 PRINT@448,"";
350 GOTO 290
360 FOR J=1 TO 2
370 PMODE 0,J
380 PCLS
390 NEXT J
400 PMODE 0,1

410 SCREEN 1,0
420 FOR J=1 TO I
430 PSET(INT(PT(J)/256),PT(J)-
    INT(PT(J)/256)*256)
440 NEXT J
450 GN=1
460 A=USR0(0)
470 GN=GN+1
480 GOTO 460
490 DATA &HCC,&H75,&H5F,&HFD
500 DATA &H3F,&H83,&HFC,&H3F
510 DATA &H83,&H17,&H00,&H73
520 DATA &H8D,&H59,&HA6,&H9F
530 DATA &H3F,&H76
540 DATA &HB4,&H3F,&H80,&H27
550 DATA &H29,&HB6,&H3F,&H82
560 DATA &H84,&H0E,&H88,&H02
570 DATA &H27,&H10,&HBE,&H3F
580 DATA &H76,&HA6,&H89,&H06
590 DATA &H00,&HB4,&H3F,&H81
600 DATA &HA7,&H89,&H06,&H00
610 DATA &H20,&H17,&HBE,&H3F
620 DATA &H76,&HA6,&H89,&H06
630 DATA &H00,&HBA,&H3F,&H80
640 DATA &HA7,&H89,&H06,&H00
650 DATA &H20,&H07,&HB6,&H3F
660 DATA &H82,&H81,&H03,&H27
670 DATA &HE9,&H7A,&H3F,&H83
680 DATA &H2A,&HBA,&H86,&H7F
690 DATA &HB7,&H3F,&H83,&H7A
700 DATA &H3F,&H84,&H2A,&HB0
710 DATA &H8E,&H0E,&H00,&H10
720 DATA &H8E,&H14,&H00,&HEC
730 DATA &HA1,&HED,&H81,&H8C
740 DATA &H14,&H00,&H26,&HF7
750 DATA &H39,&H5F,&H8E,&H3F
760 DATA &H66,&H10,&H8E,&H3F
770 DATA &H78,&HA6,&H91,&HA4
780 DATA &HA0,&H27,&H01,&H5C
790 DATA &H8C,&H3F,&H76,&H26
800 DATA &HF4,&HF7,&H3F,&H82
810 DATA &H39,&H34,&H02,&H84
820 DATA &H07,&H27,&H06,&H84

```



830 DATA &H06,&H88,&H06,&H26  
 840 DATA &H44,&H86,&H10,&H3D  
 850 DATA &H1F,&H01,&HE6,&HE4  
 860 DATA &H54,&H54,&H54,&H3A  
 870 DATA &H30,&H89,&H0E,&H00  
 880 DATA &HBF,&H3F,&H6C,&HBF  
 890 DATA &H3F,&H76,&HBF,&H3F  
 900 DATA &H6E,&H1F,&H10,&H83  
 910 DATA &H00,&H10,&H10,&H83  
 920 DATA &H0E,&H00,&H24,&H03  
 930 DATA &HC3,&H06,&H00,&HFD  
 940 DATA &H3F,&H66,&HFD,&H3F  
 950 DATA &H68,&HFD,&H3F,&H6A  
 960 DATA &HC3,&H00,&H20,&H10  
 970 DATA &H83,&H13,&HFF,&H23  
 980 DATA &H03,&H83,&H06,&H00  
 990 DATA &HFD,&H3F,&H70,&HFD  
 1000 DATA &H3F,&H72,&HFD,&H3F  
 1010 DATA &H74,&H35,&H04,&HC4  
 1020 DATA &H07,&H8E,&H3F,&H5D  
 1030 DATA &H3A,&HA6,&H84,&HB7  
 1040 DATA &H3F,&H79,&HB7,&H3F  
 1050 DATA &H80,&HB7,&H3F,&H7E  
 1060 DATA &H43,&HB7,&H3F,&H81  
 1070 DATA &HA6,&H1F,&HB7,&H3F  
 1080 DATA &H78,&HB7,&H3F,&H7B  
 1090 DATA &HB7,&H3F,&H7D,&HA6  
 1100 DATA &H01,&HB7,&H3F,&H7A  
 1110 DATA &HB7,&H3F,&H7C,&HB7  
 1120 DATA &H3F,&H7F,&HB6,&H3F  
 1130 DATA &H78,&H81,&H01,&H26  
 1140 DATA &H29,&H8E,&H00,&H00  
 1150 DATA &HF6,&H3F,&H67,&HC4  
 1160 DATA &H0F,&H26,&H03,&H30  
 1170 DATA &H88,&H10,&H30,&H1F  
 1180 DATA &H34,&H10,&HFC,&H3F  
 1190 DATA &H66,&HE3,&HE4,&HFD  
 1200 DATA &H3F,&H66,&HFC,&H3F  
 1210 DATA &H6C,&HE3,&HE4,&HFD  
 1220 DATA &H3F,&H6C,&HFC,&H3F  
 1230 DATA &H70,&HE3,&HE1,&HFD  
 1240 DATA &H3F,&H70,&HB6,&H3F  
 1250 DATA &H7A,&H2A,&H2A,&H8E  
 1260 DATA &H00,&H00,&HF6,&H3F  
 1270 DATA &H6B,&HC4,&H0F,&HC1  
 1280 DATA &H0F,&H26,&H02,&H30  
 1290 DATA &H10,&H30,&H01,&H34  
 1300 DATA &H10,&HFC,&H3F,&H6A  
 1310 DATA &HE3,&HE4,&HFD,&H3F  
 1320 DATA &H6A,&HFC,&H3F,&H6E  
 1330 DATA &HE3,&HE4,&HFD,&H3F  
 1340 DATA &H6E,&HFC,&H3F,&H74  
 1350 DATA &HE3,&HE1,&HFD,&H3F  
 1360 DATA &H74,&H39,&H01,&H80  
 1370 DATA &H40,&H20,&H10,&H08  
 1380 DATA &H04,&H02,&H01,&H80

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**Old English      Cartoon**

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**Gay Nineties**

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**Tape 2: Broadway/Old Style**

**Broadway Oldstyle**

**Tape 3: Business/Antique**

**Business Antique**

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**Tape 4: Wild West/Checkers**

**Wild West Checkers**

**Tape 5: Star**

Hebrew

**Stars**      ש ו ר ו ם

Victorian (Standard and Reverse only)

**Victorian**

**Tape 6: Block/Computer**

**Block  
COMPUTER**

## The OS-9 Calligrapher

**\$39.95**

**Requires OS-9 Version 01.01.00** and a dot matrix printer. **The OS-9 Calligrapher** reads a standard input text file which contains text and formatting directives to produce standard output for printer or disk. You can specify which font to use; centering; left, right or full justification; line fill; narrow mode; margin; line width; page size; page break and indentation.

These disks of additional typestyles are available for **\$49.95 each**. They are not compatible with the **CoCo Calligrapher** typestyles or program. OS-9 typestyle disk must be used with the **OS-9 Calligrapher**.

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**Disk 2** - OS-9 version of all type styles on Tapes 4, 5 and 6.

Dealer and author inquiries are always welcome. Canadian dealers should contact Kelly Software Distributors, Ltd., P.O. Box 11932, Edmonton, Alberta T5J-3L1, (403) 421-8003.

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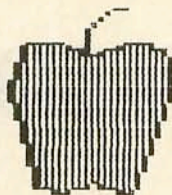
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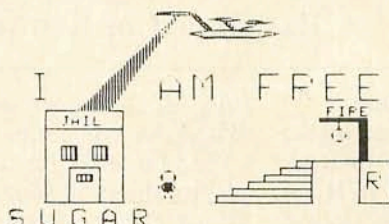


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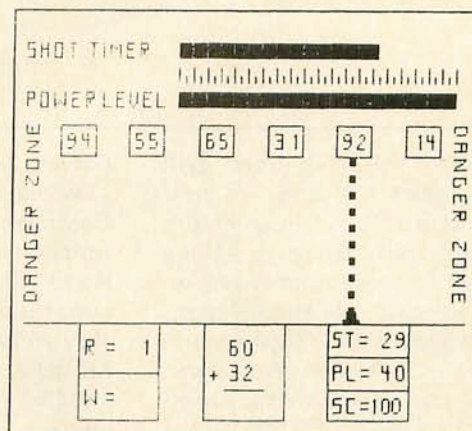
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## KISSable OS-9

# The Disk BASIC/OS-9 Connection

By Dale L. Puckett  
Rainbow Contributing Editor

**To** build better soldiers, drill sergeants tear down new recruits to nothing before rebuilding them into soldiers. Installing a new version of an operating system on the personal computer is an analogous process. I love the new 2.00.00 version of OS-9. However, the transition hasn't been painless and we'll share the observations of one OS-9 software wizard this month.

We'll take an in-depth look at a new product that should make it easier for dedicated Disk BASIC users to enter the OS-9 world. We'll also introduce several new RAM disks and show different ways to use them, plus spotlight some programs from Kevin Kuehl. To show how the same job can be done with two different languages, we are listing versions written in both assembly language and C.

*Dale L. Puckett, who is author of The Official BASIC09 Tour Guide and co-author, with Peter Dibble, of The Official Rainbow Guide to OS-9, is a free-lance writer and programmer. He serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. Dale works as a U.S. Coast Guard chief warrant officer and lives in Alexandria, Virginia.*

## Drivers Needed for New Version

We have been reading the mail on the CompuServe OS-9 SIG with interest. Immediately after OS-9 Level II hit Radio Shack shelves, people started complaining their *Word-Pak* and *Word-Pak II* drivers would not work. Ed Bender, the software wizard at PBJ, handled most of the inquiries personally.

Bender worked hard with a disassembler and a little assistance from Fort Worth to get the new drivers online. But, the new drivers were not compatible with the earlier *Word-Pak* drivers or the *O-Pak* drivers from FHL.

"We didn't have much trouble implementing the drivers for the *Word-Pak* once we figured out what Microware did with the CO80 driver for the phantom Tandy video board," Bender said. "Most of our problems came after the fact and we have been getting some complaints about the reduced screen control functions implemented in the current version.

"Actually, this is good and bad at the same time," Bender said. "Someone had to define a standard for screen control functions. While this was somewhat accomplished by *O-Pak* and *Word-Pak*, much of Tandy's OS-9 software was not compatible with either. Now, it is guaranteed that all Tandy (and hope-

fully all third-party software) will be *Word-Pak* compatible."

Bender also received some complaints about the loss of control for the *Word-Pak II* screen control relay. *Word-Pak II* users with a single composite video-monitor connected to *Word-Pak II* and the standard CoCo video output can no longer switch the screen back and forth to alternately display graphics and text.

For example, if you were editing a BASIC09 program that used graphics with the earlier PBJ drivers the *Word-Pak II* display could be used to edit it. Later, when running the program, the screen could display text while the graphics were being drawn. Now, the only solution is a POKE to *Word-Pak II* to switch the screens back and forth — a method that does not find favor with OS-9 purists.

Bender has an idea that may solve the problem: "First, create a small OS-9 procedure that, once invoked, would put itself to sleep, only to wake up once every second or two to check the path descriptor for TERM to see if the TYPE byte has been changed," Bender said. "If a change is detected, toggle the screen control relay to the appropriate display. The program should be simple and use very little CPU time."

Bender also noted that something



needs to see if GRFO is active in order to control the graphics display. This program needs to allow all other programs to run concurrently with it.

Bender says PBJ has had very few complaints about the loss of control for the scroll rate of *Word-Pak II*. But, they

set of patches to Delphi's CoCo SIG. They let the DISTO Display 80 adapter card work with the CO80 subroutine module that is standard with Tandy's Version 2.00.00 of OS-9. Some of you may want to use them to maintain a strict Tandy standard.

them into the boot file with the Config utility.

With the additional capability made possible by the new hardware from Tandy and third-party vendors, we must make choices about managing the operating system on our Color Computers. OS-9's modularity makes it possible and new hardware and software make it fun. Next month we hope to review the concept of modularity and introduce several approaches to the management of our Version 2.00.00 system software.

## ***"This structure is invisible to Disk BASIC and requires no knowledge of OS-9."***

have had many complaints about the loss of cursor-style control and they plan to fix it.

"Please point out that the way CO80 is linked into CCIO as a subroutine makes it nearly impossible to add display codes to the CO80 module without patching CCIO," Bender said. "Any codes other than those defined by Tandy are not passed on to the CO80. So, even if the routines are in place, they never get called. The cursor-style control is an exception, since Tandy provided a sequence to change the cursor color in CO32."

Here's good news for people using public domain *Word-Pak* drivers. A new public domain driver for *Word-Pak II* that runs with Version 2.00.00 is now available in the DL6 database on the CompuServe OS-9 SIG, according to SysOp Wayne Day. The new offering was written by Bill Dickhaus, the OS-9 section leader on the CoCo SIG.

### **CO80 Patches Work with DISTO Display 80**

Dennis McMillan has contributed a

However, many may want to use the new DISTO drivers that Brian Lantz is writing. They will be compatible with *O-Pak* and the old *Word-Pak* drivers and will eliminate some of the shortfalls in the Tandy CO80 module.

In the Tandy CO80 module, there are six occurrences of \$FF78. To make the DISTO board work with the module, change each \$FF78 to \$FF54. Also set the ":switch" at \$FF57 to "on" before booting OS-9. Here is the list of offsets supplied by McMillan.

- <SPACE>.+24
- <SPACE>.+48
- <SPACE>.+19
- <SPACE>.+3E
- <SPACE>.+EF
- <SPACE>.+69

Note that these offsets move from one to the next. You do not need to link to CO80 each time — only the first time. After making these changes, save them in a file and store them in the modules directory of the "Boot/Config" disk so they can be loaded easily. Or install

### **WBASIC — An OS-9 Disk that Thinks It's Disk BASIC**

Late last year, Alan Reinhart of Royersford, Pennsylvania, had a novel idea. Today, he has a major product, and CoCo users migrating to OS-9 time will find it very interesting. *WBASIC* is a ROM-based program. It replaces Disk Extended BASIC and stores Disk BASIC data and programs in OS-9 formatted files on a hard disk.

When I saw *WBASIC*, I was immediately impressed. Reinhart had written code that makes directories on an OS-9 formatted hard disk look like standard Disk BASIC floppy disks.

Why is this significant? Since the entire hard disk uses a standard OS-9 format, OS-9 programs and data can be stored on it also. And, since the "RSDOS Floppy" directories are actually OS-9 directories, OS-9 application programs and utilities can also read from or store data in them. People with a heavy investment in standard Disk BASIC programs and data can continue to use their original programs and accumulated data while they move up into full OS-9 operation.

With *WBASIC* you can copy a floppy disk containing a number of *Elite*, *VIP*

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or other Color Computer word processor files; edit with an OS-9 word processor like *DynaStar* or *Stylograph*; check spelling with an OS-9 program like *DynaSpell* and print using an OS-9 text processor like *TS Word*. *WBASIC* should ease the entry of thousands of Color Computer users into the OS-9 computing world.

"The existing Disk BASIC file structure has no real expansion capabilities," Reinhart said. "Several vendors selling Winchester drives discovered that quickly. Managing the 20,480 sectors on a five-megabyte disk instead of the usual 620 sectors on a floppy has been a real problem. Several attempts have been made to solve the problem by placing a number of standard floppy-sized volumes on a hard disk drive but this approach is not totally successful."

Reinhart came up with his method because he was concerned about what he perceived as a "go to OS-9 or forget it" policy at Tandy.

"Their policy is fine if you are interested in working with OS-9," Reinhart said. "But, if you are just starting and are not interested, there was no easy answer."

A common file structure lets Reinhart's *WBASIC* talk to OS-9. While Disk BASIC has been hard-coded to live in a 35-track, single-sided environment, OS-9 was designed for expandability.

"I have recreated the OS-9 file handling system with my own code," Reinhart said. "The result is the Disk BASIC user gains the benefit of a second, more capable file structure while keeping compatibility with the old. But, at the same time, OS-9 users can now write short programs in Disk BASIC then boot OS-9 and access the same data files from BASIC09."

*WBASIC* uses the drive number part of a file specification to communicate with the hard disk drive. Drive numbers 4 through 13 are placed on the hard disk, each in its own directory. This structure is invisible to the Disk BASIC user and requires no knowledge of OS-9. However, to use OS-9, simply type DOS and log to the Winchester. OS-9 users see a standard OS-9 disk.

To make *WBASIC* work, Reinhart did his homework with *Disk Basic Unraveled*. He located the addresses where he could intercept the various Disk BASIC statements and jump to his own code. When you use a *WBASIC* OPEN statement with a drive number higher than three, it creates an OS-9 file in a directory on the hard disk drive.

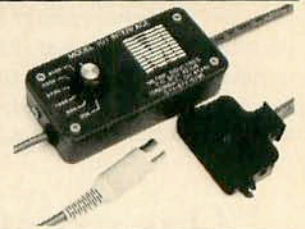
Reinhart stores all Disk BASIC flop-

## Metric Industries

### Model 101 Interface \$39.95

The Model 101 is a serial to parallel interface intended for use with a COCO and any Centronics compatible parallel input printer. The 101 has 6 switch selectable baud rates (300-9600). The 101 is only 4" x 2" x 1" and comes

with all cables and connectors for your computer and printer.



### The Model 104 Deluxe Interface \$51.95

The Model 104 is a serial to parallel interface like the Model 101 but it has the added feature of a serial port (sometimes referred to as a modem switch). This feature allows the connection of a parallel printer and any serial device (modem, serial printer

etc.) to your computer. You may then select either output, serial or parallel, with the flip of a switch. The 104 is only 4.5" x 2.5" x 1.25" and comes with all cables and connectors for your computer. You supply the serial cable for your modem or other serial device.



### Model 103 Combo \$68.95

With the turn of a knob the model 103 switches your computer's RS232C serial port to any one of 3 outputs — 2 serial and 1 parallel. The serial ports may be used for modems, serial printers or even another computer. The parallel port can

be used with any Centronics compatible printer. The 103 has the best features from the 101 and 102: color coded position indicator lights, 6 switch selectable baud rates, heavy anodized aluminum cabinet, and many more.



### Model 102 Switcher \$35.95

The Model 102 has 3 switch positions that allow you to switch your computer's serial output between 3 different devices (modem, printers or another computer). The 102 has color coded lights that indicate the switch position. These

lights also act as power indicators to let you know your computer is on. Supplied with the 102 are color coded labels that can be applied to your accessories. The 102 has a heavy gauge anodized aluminum cabinet with non-slip rubber feet.



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## Listing 1: *COMM.C*

/\* COMM: A UNIX-like utility to print non-identical lines in two files.

Microware C Language

Kevin Kuehl  
806 Division Road  
Valparaiso, IN 46383  
February 5, 1986

Calls: comm file1 file2  
comm file1 <file2

```
*/
#include <stdio.h>
#include <ctype.h>

main(argc, argv)
int argc;
char **argv;
{
    FILE *fp1, *fp2, *fopen();

    if (argc == 1)
        error("Usage: comm file1 [file2]", NULL);

    else if (argc == 2)
        if (fp1 = fopen(*++argv, "r")) {
            comm(fp1, stdin);
            fclose(fp1);
        } else
            error("Can't open", *argv);

    else if (fp1 = fopen(*++argv, "r"))
        if (fp2 = fopen(*++argv, "r")) {
            comm(fp1, fp2);
            fclose(fp1);
            fclose(fp2);
        } else
            error("Can't open", *argv);

    else
        error("Can't open", *argv);
}

compare(string1, string2)
char *string1, *string2;
{
    while (isspace(*string1))
        *string1++;

    while (isspace(*string2))
        *string2++;

    return(strcmp(string1, string2));
}

comm(ptr1, ptr2)
FILE *ptr1, *ptr2;
{
    char line1[120], line2[120];
    static char filler[10] = " ";
    int length1, length2;

    while (fgets(line1, 120, ptr1) && fgets(line2, 120, ptr2))
    {
        length1 = strlen(line1);
        length2 = strlen(line2);
```

pies or directories in a master directory named RSDOS. Each floppy is actually a subdirectory named RSDOS0 to RSDOS9. When you type a Disk BASIC command line like DIR B, *WBASIC* performs the equivalent of the OS-9 command, DIR /HO/RSDOS/RSDOS8.

To make room for his code, Reinhart moved the start of Disk BASIC's free memory area from \$0989 to \$0C00. This means that any Disk BASIC machine language programs that are not position-independent and start at \$0989 do not work with *WBASIC*. However, Reinhart says he has tested hundreds of programs and almost all of them work.

## New RAM Disks Increase OS-9 Speed

I met Tony DiStefano for the first time at RAINBOWfest-Palo Alto and one of the things we discussed was his new Super RAM Disk. I was so impressed with his products that I bought a 512K Super RAM cartridge and a DISTO Controller with an enhanced Display 80 adapter.

When DiStefano came up with the idea to add adapters to his controller and RAM disk cartridges, he solved a lot of problems. Some of us have had our Multi-Pak slots full for a while. We have been wondering how to add more hardware like the Radio Shack Speech Cartridge to our CoCo. Tony has come to the rescue.

Many people at Palo Alto were impressed, too. By the time I talked to Tony, his distributor (CRC Inc., 10802 Lajeunesse, Montreal, Quebec, Canada H3L 2E8, phone 514-383-5293) had sold out. I had to order mine.

Bob Rosen — WHIFFLE on Delphi's Color Computer SIG — helped me out. He shipped Tony's 256K Super RAM cartridge and it arrived the next day. The 256K Super RAMDisk sells for \$129.95. The 512K version costs \$169.95.

I quickly installed the OS-9 RAM Disk drivers licensed by Brian Lantz and was soon working with a 512K CoCo: the DISTO Super RAMDisk plus the *ThunderRAM*. My own 512K Super RAM has also arrived and very soon I'll be cooking with a 768K CoCo. And, as if that weren't enough, DiStefano has made it possible to put an additional 512K of RAM on his Super RAM cartridge. If I added that 512K, I would be running with 1280K — in a CoCo. I'm impressed.

## Getting the Most from RAMDisk

Brian Lantz certainly gives versatility



in the RAMDisk software for the Super RAM cartridge. A ready-made device descriptor makes the 256K RAM disk look like a single-sided, 40-track floppy disk. Data and programs can be moved quickly from a floppy to the RAM disk using the OS-9 Backup utility command. It takes less than 40 seconds to do the whole job.

A modules directory on the disk contains a device descriptor that covers almost every option. The descriptors are in the correct format to work with the Config utility that comes with Version 2.00.00. By selecting the proper descriptor, you pick the number of the drive, either R0, R1 or R2; the Multi-Pak slot number desired, one through three; and the size of the RAM disk, either 256K or 512K.

After I had used the RAMDisk as the mirror of a single-sided, 40-track disk for several weeks I decided to take a closer look. I discovered that I was losing 77,824 bytes or 304 sectors of high speed RAMDisk by operating in this mode. There are 262,144 bytes or 1,024 sectors of memory available on the DISTO Super RAMDisk. However, the 40-track floppy can only only 184,320 bytes or 720 sectors.

At first, I thought I had only two alternatives. I could run the RAMDisk as a single-sided, 40-track drive and gain the advantage of the high-speed backup operation. Or, I could configure the RamDisk with 1,024 sectors and use all available RAM. Unfortunately, with the latter method I would need to use the Dsave utility command to copy OS-9 directories or disks to the RAMDisk — an operation that takes several minutes.

After a little thought I decided to take advantage of my double-sided, 40-track drives. I would use both sides of the drive, but not all of the tracks. I wound up formatting a disk with 56 tracks — 28 per side. This produces 1,008 sectors of storage.

I called up the OS-9 Debug utility and modified the /R1 device descriptor to make the RAMDisk look like 28 tracks with 18 sectors per track on two sides. I then used the new Version 2.00.00 Format utility to create the disk. Format ran properly and the OS-9 Free utility command reported that I had 1,008 sectors available. I moved right ahead and ran the Backup utility program. Backup up ran successfully and copied about half of the special 28-track double-sided disk. Then it reported a Media Full error. It made sense to me that you can't have two sides on a

```

line1[length1 - 1] = line2[length2 - 1] = '\0';

if (compare(line1, line2))
    printf("%-25.25s  %-25.25s\n", line1, line2);
else
    printf("%52.52s  %-25.25s\n", filler, line1);
    }
}

error(err1, err2)
char *err1, *err2;
{
    fprintf(stderr, "COMM: %s %s\n", err1, err2);
    exit(0);
}

```

## Listing 2: TR.C C

/\* TR: A UNIX-like transliteration utility.  
Microware C Language

Kevin Kuehl  
806 Division Road  
Valparaiso, IN 46383  
January 20, 1986

Calls: tr from to <file changes 'from' to 'to'  
tr from <file deletes 'from'

```

*/
#include <stdio.h>

int not = FALSE; /* Regular pattern match */
int squeeze = FALSE; /* Do not compress repeated characters */

main(argc, argv)
int argc;
char **argv;
{
    char set1[4], set2[4];
    int argcount = 3;

    if (argc == 1) {
        fprintf(stderr, "Usage: tr [-s] to from\n");
        exit(0);
    } else if ((*++argv)[0] == '-') {
        if (((*argv)[1] == 's') || ((*argv)[1] == 'S')) {
            squeeze = TRUE;
            argv++;
            argcount++;
        } else
            error("Parameter error ", *argv);
    }

    if (makeset(*argv, set1) == FALSE)
        error("Parameter error ", *argv);

    if (argc == argcount) {
        if (makeset(*++argv, set2) == FALSE)
            error("Parameter error ", *argv);
    } else
        makeset(NULL, set2);

    translit(set1, set2);
}

convert(c, conversion, boundptr)
char c, conversion;

```



```

char *boundptr;
{
    c = c - conversion + *boundptr++;
    if (c > *boundptr)
        c = *boundptr;

    return(c);
}

error(err1, err2)
char *err1, *err2;
{
    fprintf(stderr, "TR: %s %s\n", err1, err2);
    exit(0);
}

makeset(param, set)
char *param, *set;
{
    int ptr;

    for (ptr = 0; ptr < 4; ptr++)
        set[ptr] = NULL;

    if (*param == '~') {
        not = TRUE;
        param++;
    }

    set[0] = param[0];
    if (set[0] != NULL)
        switch (strlen(param)) {
            case 1:
                set[1] = param[0];
                break;
            case 3:
                set[1] = param[2];
                break;
            case 2:
                set[1] = param[0];
                set[2] = param[1];
                set[3] = param[1];
                break;
            case 6:
                set[1] = param[2];
                set[2] = param[3];
                set[3] = param[5];
                break;
            default:
                return(FALSE);
        }
    return(TRUE);
}

translit(from, to)
char *from, *to;
{
    char c, lastc = '\0';

    while ((c = getchar()) != EOF) {
        if (c >= from[0] && c <= from[1]) {
            if (not == FALSE)
                c = convert(c, from[0], &to[0]);
        } else if (c >= from[2] && c <= from[3]) {
            if (to[2] == NULL) {
                if (not == FALSE)
                    c = convert(c, from[2], &to[0]);
            } else if (not == FALSE)
                c = convert(c, from[2], &to[2]);
        }
    }
}

```

RAMDisk, but I thought I could fool the software.

As it turned out, I did fool the software by taking a different approach. Fortunately for my experiment, the Backup utility command does not check everything when it looks to see if the two disk formats are the same. It only checks the total number of sectors.

After discussing the problem with Brian Lantz, I changed the number of sides in the RAMDisk descriptor back to one and changed the number of tracks to 56 rather than 28. I left the number of sectors per track set to 18 so it would match the floppy media. I saved the new version of the device descriptor again, ran the Attr utility command on it to set the execute and public execute attributes of the new file.

Then, I formatted the RAMDisk again using the new descriptor. Free again reported 1,008 sectors available. I ran Backup again. It worked.

What did I gain from the experiment? Time, mainly. When I did a backup from my specially formatted 28-track, double-sided floppy to the RAMDisk it took 41 seconds. Then, I ran *DirCopy*, a fast directory copy utility from Computerware. It took three minutes and 26 seconds.

You probably noticed that this method does not use 4,096 bytes of the 256K available on the RAMDisk. I wasted 16/18 of a track. You can get around this by modifying the device descriptor for the floppy disk so you can format the double-sided 40-track disks in an even more non-standard fashion.

For example, why not format them to hold 64 tracks (32 tracks on two sides) with 16 sectors in each track? This gives exactly 262,144 bytes or 1,024 sectors on the floppy. A RAMDisk formatted this way does the job nicely and wastes no space. Since you won't be exchanging these non-standard floppies with anyone, set them up any way you desire.

I haven't decided how to handle my 512K RAMDisk yet. If I buy a double-sided, 80-track disk I could use a similar trick. 512K of RAM holds 2,048 sectors. If I formatted a disk to hold 128 tracks (64 on each side) with 16 sectors in each track it should work perfectly. To maintain the 18 sectors per track standard so the device descriptor won't have to be modified for the 80-track floppy disk, set it up with 112 tracks (56 tracks on each side) containing 18 sectors per track.

### Changing Device Descriptors

To change the device descriptors used



by the floppy disk drives, use the OS-9 Debug utility command. We'll go step by step, but first we need to give a short description of a device descriptor.

Following the standard module header in every device descriptor that uses the RBF file manager, there is a table that defines the disk drive being used. The first byte of the table is located 18 decimal bytes (\$12 bytes hexadecimal) from the start of the module containing the device descriptor. The following table shows the offset from the start of the module, the name of the location in the OS9Defs files and a short description of the information it contains.

Offset	Name	Description
\$12	IT.DTP	Type of device (always 01 for disk drives)
\$13	IT.DRV	Drive number (DISTO slot number)
\$14	IT.STP	Step rate (00 for RAMDisks)
\$15	IT.TYP	Device type
\$16	IT.DNS	Media density
\$17	IT.CYL	Number of tracks
\$19	IT.SID	Number of sides
\$1A	IT.VFY	Verify if 00, no verify if 01
\$1B	IT.SCT	Number of sectors per track
\$1D	IT.TOS	Number of sectors per track in Track 0

To change the format on the RAM-Disk and floppies, change IT.CYL, the number of tracks and IT.SCT, and the number of sectors per track. To start, type:

OS9: debug <ENTER>

When you see the Debug prompt, D:, type:

L R0 <ENTER>

This links debug to the start of the module containing the device descriptor named R0. Use the name of the device descriptor you want to modify here. After linking to the descriptor, move to the byte containing the number of tracks. Since it is at an offset of \$17 hexadecimal bytes from the start of the module, type:

. <SPACE> .+17 <ENTER>

Notice how the debug utility commands use hexadecimal notation for these offsets. Displayed now is an address followed by the value of the data stored at that address. It should contain two zeros (00).

```

) else if (not && (c != '\n'))
    c = to[0];

if (squeeze && (c == lastc))
    ; /* If we compress repeats, then do nothing */
else
    putchar(c);
lastc = c;
)
)

```

### Listing 3: COMM.A

```

* COMM: A UNIX-like file comparison utility with three columns
* 6809 Assembly Language
*
* Kevin Kuehl
* 806 Division Road
* Valparaiso, IN 46383
* February 5, 1986
*
* Calls:  comm file1 file2    compares 'file1' to 'file2' and
prints lines
*          comm -l file1 file2 print only identical lines and
from 'file2'
*
*
    NAM Comm

    IFP1
    USE /D0/DEFS/OS9Defs
    ENDC

    MOD commend,commnam,PRGRM+OBJCT,REENT+1,comment,commmem
commnam FCS /Comm/

*****
*
* DATA AREA
*
    ORG 0
flag RMB 1
path1 RMB 1
path2 RMB 1
buffer1 RMB 120
buffer2 RMB 120
storage RMB 120
    RMB 200 Parameter Area
    RMB 200 Stack Area
commmem EQU .

*****
*
* PROGRAM AREA
*
comment CLR flag we print all columns
CLRb clear the flag holder
comm05 LDA ,X get first parameter character
CMPA #- is it an option?
BNE opnfile no, then open the files
LEAX 1,X bump up the pointer
comm10 LDA ,X+ get next character
CMPA #$0D are we done?
LBEQ errmsg yes, then syntax error
CMPA #$20 or just some white space?
BEQ opnfile yes, then go
CMPA #'1 do we blank first column?

```



```

BNE comm15 not yet, go
ORB #%00000001 yes, set the flag
BRA comm10 and go for more
comm15 CMPA #'2 do we blank second column?
BNE comm20 not yet, go
ORB #%00000010 yes, set the flag
BRA comm10 and go for more
comm20 CMPA #'3 do we blank third column?
LBNE errmsg no, then syntax error
ORB #%00000100 set the flag
BRA comm10 and go for more
opnfile STB flag save the option flag
LDA #READ. use READ access mode
OS9 I$OPEN open the first file name
LBCS error branch on error
STA path1 save the path number
LDA #READ. use READ access mode
OS9 I$OPEN open the second file name
LBCS error branch on error
STA path2 save the path number
readin LEAX buffer1,U point to the first buffer
LDY #120 get its length
LDA path1 get the path number
OS9 I$READLN read a line of input
LBCS commerr branch on error
TFR Y,D put line length in 'B'
STB -1,S save it for a bit
LEAX buffer2,U point to the second buffer
LDY #120 get its length
LDA path2 get the path number
OS9 I$READLN read a line of input
LBCS commerr branch on error
TFR Y,D put line length in 'B'
LEAX buffer1,U else point to the first line
LEAY buffer2,U and also to the second line
CMPB -1,S are the lengths the same?
BNE test05 no, then go
test DECB are we done?
BEQ test30 yes, then we must go
LDA ,X+ else get a character in line 1
CMPA ,Y+ is it the same as in line 2?
BEQ test yes, then get next character
test05 LDB #25 get length of first section
LEAX buffer1,U point to the first line
LEAY storage,U point to the out line
LDA flag get the flag
CMPA #%00000001 do we print this column?
BEQ test15 no, but we print second
CMPA #%00000011 do we print any columns?
BEQ readin no, we print nothing
test10 LDA ,X+ get the next character in line
CMPA #$0D is it a carriage return?
BEQ test15 yes, then go
STA ,Y+ no, then save the character and bump 'Y'
DECB are we done?
BNE test10 no, then store next character
test15 ADDB #2 add in the spacer length
LDA #$20 get an ASCII <space>
test20 STA ,Y+ and save it
DECB are we done?
BNE test20 no, then save it again
LDA #$0D get a carriage return
STA ,Y save in case we need it
LDA flag get the flag
CMPA #%00000010 do we print this column?
BEQ prntthem no, then go
LDB #25 get length of second section
LEAX buffer2,U point to second section
test25 LDA ,X+ get the next character

```

Press the ENTER key once to move to the lowest significant byte of the two-byte value being modified. Debug prints the next address followed by a one-byte value. If you are changing the device descriptor of a 40-track drive, Debug returns a value of \$28 (hexadecimal) here. Now type an equal sign (=) followed immediately by the new value wanted in the descriptor. For example, to wind up with a 64-track RAM disk, type:

=40 <ENTER>

Note here that \$40 is 64 decimal. After changing the number of cylinders, link to the start of the device descriptor module again like before. Move to the location of IT.SCT, which is at an offset of \$1B. Make this change in a similar manner, then check or set the value of IT.TOS. Exit the debug utility by typing a Q or q as the first letter following the prompt. You then see the standard OS-9 prompt.

At this point, you can use the modified device descriptor. However, you will probably want to save it using the OS-9 Save utility command. If the device descriptor module is named R0 in memory and you want to save it in a file called R0.New, use the following command line.

OS9: save R0.New R0 <ENTER>

This command line creates a file named R0.New in the current execution directory which is usually /D0/CMDS. The module R0 is stored in that file. Before attempting to load the file, run the Attr utility command to set the execute and public execute attributes for the file.

### Banker RAM disk is an Alternative

I recently had a chance to see the J&R Electronics 512K Banker. It supports all versions of the Color Computer and, since it installs inside the Color Computer, a multipack is not needed.

With the Banker you get a RAM Disk. And, since OS-9 already allows printing in the background by using an ampersand (&) at the end of a command line, you get a simple print spooler without buying any special software. When listing a file from the RAM disk to the printer, there is no wait for floppy access, so the system works efficiently at the same time.

The installation procedure for the Banker is simple if you have two drives. Put the system disk in Drive 0 and your Banker OS-9 disk in Drive 1, then run the install procedure file for the type of RAM disk desired and the CoCo does



all the rest. A utility that fixes the OS-9 boot disks to boot with the Banker installed is also included.

The Banker can be installed as a 512K or 256K RAM system and it comes in varying levels of completion. Options start with a bare board at \$34.95 — you buy the parts — and run up to a completely assembled and tested 512K board that sells for \$149.95. Get the details from Jesse at J & R Electronics, P.O. Box 2572, Columbia, MD 21405, phone (301) 987-9067.

All except the assembled and tested 512K board require piggybacking RAM chips for expansion to 512K. If you do not feel comfortable with piggyback chips, purchase their new Memory Expansion Board Kit for \$29.95. This kit is necessary to install a Banker in the two-chip Korean CoCo 2s.

### KShell Makes Life Pleasant

Computerware's *KShell* is the star of a new set of *Advanced Utilities for OS-9* from Paul Searby's Encinitas, California software house. It's UNIX-like features let you work quicker and smarter. *KShell* is a direct replacement for the standard OS-9 Shell. In fact, internally it is named Shell.

*KShell* gives you the ability to use wild cards on the OS-9 command line, set the priority of any process and make multipath searches. If you are tired of receiving the Error #216 "File Not Found" message, *KShell*'s path facility will make your day. To install and run it, simply type:

```
OS9: ex load /d0/cmds/kshell <ENTER>
```

A *KShell* path command line looks like this:

```
OS9: path=/d1/cmds <ENTER>
```

After this line is typed, *KShell* first checks the current execution directory when it is looking for a program. If it does not find the program there it looks in /d1/cmds. You are not limited to one additional path, since you can place as many as will fit in a 64-character line. Each path in that line must be separated by a colon. Here's a sample:

```
OS9: path="/r1:/hl/cmds:/d1/cmds" <ENTER>
```

If you forget which paths have been assigned to *KShell*, find out by typing, "Echo \$path". If you forget something when you type the path, append things to it like this.

```
OS9: path=$path+":"/d1" <ENTER>
```

The beauty of these commands is they only need to be typed once. And if you

```
STA ,Y+ save it and bump 'Y'
CMPA #$0D is it a carriage return?
BEQ prntthem yes, then go
DECB are we done?
BNE test25 no, then get next character
LDA #$0D else get a carriage return
STA ,Y save it in the string
BRA prntthem print the lines
test30 LDA flag get the flag
CMPA %00000100 do we print this column?
LBHS readin no, then go
LEAY storage,U point to the line
LDA #$20 get a SPACE
LDB #54 get loop count
test35 STA ,Y+ save it in the line
DECB are we done?
BNE test35 no, then save some more
LEAX buffer1,U point to the line
LDB #25 get amount to be shown
test40 LDA ,X+ get next character
STA ,Y+ save it in string
CMPA #$0D is it a carriage return?
BEQ prntthem yes, then go
DECB are we done?
BNE test40 no, then go
LDA #$0D get a carriage return
STA ,Y+ save it in the line
prntthem LEAX storage,U point to the line
LDY #120 get its length
LDA #1 use standard output
OS9 I$WRITLN and print the line
LBCC readin if no error, then go
BRA error branch on error
```

```
errmsg LEAX message,PCR get the message
LDY #120 get its length
LDA #2 use STANDARD ERROR path
CLRB clear the error channel
OS9 I$WRITLN print the message
```

```
commerr CMPB #E$EOF is error and 'EOF'?
BNE error no, then error exists
LDA path1 get the path number
OS9 I$CLOSE and close the file
BCS error branch on error
LDA path2 get the path number
CLRB clear the error channel
OS9 I$CLOSE and close the file
error OS9 F$EXIT terminate the process
```

```
message FCC /Usage: comm [-[1,2,3]] file1 file2/
FCB $0D
```

```
EMOD
command EQU *
END
```

### Listing 4: TR.A

```
* TR: A UNIX-like transliteration utility.
* 6809 Assembly Language
*
* Kevin Kuehl
* 806 Division Road
* Valparaiso, IN 46383
* February 5, 1986
*
```



```
* Calls:  tr a A <file      converts all 'a' to 'A' in 'file'
*         tr A-Z a-z <file  converts all letters to lower case
*         tr -s a A <file   strips out all same consecutive
characters
*         tr ~A-Za-z <file  deletes all non-alpha characters
*
*
```

NAM Tr

```
IFP1
USE /D0/DEFS/OS9Defs
ENDC
```

```
MOD trend, trnam, PRGRM+OBJECT, REENT+1, trent, trmem
trnam FCS /Tr/
```

\*\*\*\*\*

\*  
\* DATA AREA

```
*
  ORG 0
lastc RMB 1
not RMB 1
squeeze RMB 1
from RMB 4
to RMB 4
set1 RMB 7
set2 RMB 7
line RMB 120
  RMB 200 Parameter Area
  RMB 200 Stack Area
trmem EQU .
```

\*\*\*\*\*

\*  
\* PROGRAM AREA

```
*
trent LEAY set1,U point to storage
LEAY 1,Y leave space for length
CLR not use regular matching
CLR set1 length = 0
CLR set2 length = 0
CLR squeeze we do not compress lines
CLRB set counter = 0
tr05 LDA ,X+ get next character
CMPA #$20 is it white space?
BEQ tr05 yes, then go
CMPA #$0D are we done?
BEQ message yes, then error
INC not set to use NOT
CMPA #'~ is it a NOT?
BEQ tr15 yes, then go
CMPA #'- do we have an option?
BNE tr10 no, then go
LDA ,X+ get next character
ANDA #11011111 convert to UPPER CASE
CMPA #'S do we compress lines?
BNE message no, then go
INC squeeze set to compress lines
BRA tr05 and go for more
tr10 CLR not no, then correct
STA ,Y+ else save in set
INCB length = length + 1
tr15 LDA ,X+ get next character
CMPA #$20 are we at end of string?
BEQ tr20 yes, then go
CMPA #$0D or at end of parameter?
BEQ tr40 yes, then go
```

do it from a procedure file, the whole operation can be semi-automatic. *KShell* also supports up to four macros. Each macro can contain up to 48 characters.

Like the UNIX Shell, *KShell* treats a command placed in single quotes with the output of that command. This sounds complicated, but it makes sense. Look at a few examples:

```
OS9: echo The date is 'date'. <ENTER>
OS9: echo chd 'pxd' <ENTER>
OS9: echo The disk in drive one
      is 'free /dl' <ENTER>
```

The first line prints "The date is" followed by the output of the standard OS-9 date utility command. The second example changes the current data directory to the same as the current execution directory since *pxd* returns the name of the current execution directory on the standard output path. The last command line works like the first.

The wild cards are the asterisk (\*) and the question mark (?). An asterisk matches any number of characters. A question mark matches any single character. Since the files that match the wild cards are substituted in the command line before they are passed to a command, *KShell*'s wild cards are available to all programs.

The ability to assign default paths alone makes *KShell* worth the price of the entire *Advance Utilities for OS-9* package. Additionally, you get a new copy utility command named *cpy* that allows copying multiple files to a given directory.

The archive utility in the package is valuable if you have a hard disk and want the ability to make backup copies easily. Operation is almost automatic and after archive fills one floppy it prompts for a new one.

To round out the package, Computerware includes an unload utility that completely removes modules from memory and a flink utility that gives a way to make any existing file that is contiguous the boot file.

### A Helpful Hint

There is a way to make a new boot file that's almost easier than using the new Config utility. First, create a new directory on the disk and copy each file you want in the new OS9Boot file into that directory. Then, instead of creating a separate bootlist file, use either the Microware 'd' utility or the "ls" utility from several of the third-party vendors and type this command line.

```
OS9: ls ! dsave <ENTER>
```



## Two from Kuehl

This month, our feature programs were written by Kevin Kuehl, a senior high school student in Valparaiso, Indiana. Kuehl contributed several assembly language programs to "KISS-able OS-9" last summer. He's back with two new programs written in both assembly language and C.

*Comm* is a utility that compares two text files or a file to standard input. It is handy for programmers who are looking for changes they have made in a source file. *Tr* is a standard translit utility that can squeeze lines and use sets of characters. Sample OS-9 command lines are shown as comments in each listing.

Kuehl also sent some advice with his programs. "Tell everyone how important it is to write their assembly language programs in modules," he said. "This makes them much easier to debug.

"Also, make sure they *always* send their errors to the standard error path," Kuehl added. "It is unnerving to send a file down a pipeline and find (if you are lucky) an error at the end. Or worse yet, garbage that once was an error message. Use LDA #2 in assembly language or "fprintf(stderr, " ") in C for all error messages."

## Our Future

The 68K version of OS-9 may very soon be the standard operating system on most home-oriented computer systems. At a recent conference sponsored by Microsoft, Sony and Phillips proposed a new file format standard for the new compact disc technology. OS-9 68K is at the heart of the standard that supports sound and graphics as well as data on the new disks. The CD-I system uses a Motorola 68000 processor and custom graphics and sound processors still under development by Sony and Phillips. The systems may be sold as complete systems or as add-ons to existing audio CD players.

## Modularity and Version 2.00.00

Next month we hope to review the concept of modularity and present several approaches to operating system management. We need these skills when adding new hardware and software to our OS-9-based Color Computers. During the process, we'll introduce several new utility packages that help make the job easier. And, we'll publish a few more short programs to give you some programming practice and new tools at the same time. □

```
STA ,Y+ save it in set
INCB length = length + 1
BRA tr15 go for more
tr20 STB set1 save the length
LEAY set2,U point to storage
LEAY 1,Y leave space for length
CLRB set counter = 0
tr25 LDA ,X+ get next character
CMPA #$20 is it white space?
BEQ tr25 yes, then go
CMPA #$0D are we at end of parameter?
BEQ tr40 yes, then go
STA ,Y+ save in the set
INCB length = length + 1
tr30 LDA ,X+ get next character
CMPA #$20 are we done with string?
BEQ tr35 yes, then go
CMPA #$0D are we at end of parameter?
BEQ tr35 yes, then go
STA ,Y+ save it in set
INCB length = length + 1
BRA tr30 go for more
tr35 STB set2 save the length
tr40 LEAX set1,U point to first string
LEAY from,U point to storage
LBSR makeset make the set
TSTB was there an error?
BNE message yes, then go
LEAX set2,U point to second string
LEAY to,U point to storage
LBSR makeset make the set
TSTB was there an error?
BEQ translit no, then go
message LEAX usemess,PCR
LDY #120 get its length
LDA #2 use Standard Error path
CLRB clear the error channel
OS9 I$WRITLN print the message
BRA error branch on error

*****
*
* TRANSLIT 'FROM' TO 'TO'
*
translit LEAX line,U point to storage
LDY #120 get its length
CLRA use Standard Input
OS9 I$READLN read the line
BCS transerr branch on error
CLR lastc set initial value to NULL
LEAX line,U point to the line
trans05 LDA ,X get the character
CMPA #$0D are we done?
BEQ print yes, then go
PSHS X save the pointer
LEAX from,U point to compare set
LEAY to,U point to adjust set
CMPA ,X do we change the char?
BLO trans10 not yet, check more
CMPA 1,X maybe, is it in range?
BLS trans15 yes, then convert
trans10 LEAX 2,X push 'X' to second range
LEAY 2,Y push 'Y' to second range
CMPA ,X is char in range?
BLO trans20 no, then go
CMPA 1,X maybe, is it in range?
BHI trans20 no, then go
TST ,Y is there a second adjust range?
BNE trans15 yes, then use it
```



```

LEAY -2,Y back 'Y' down to first range
trans15 TST not do we have regular matching?
BEQ convert yes, then convert char
BRA store then print the character
trans20 TST not do we have regular matching?
BEQ store yes, then print character
LDA -2,Y no, then get the character
BRA store and print character
convert SUBA ,X make 'A' and offset
ADDA ,Y make 'A' a char in range
CMPA 1,Y is char in the range?
BLS store yes, then save char
LDA 1,Y else get upper limit
store PULS X get old pointer
TST squeeze do compress line?
BEQ store05 no, then go
CMPA lastc do we print the character?
BNE store05 yes, then save it
CLRA no, then save a NULL
store05 STA ,X+ save the character
TSTA is 'A' a character?
BEQ trans05 no, go for more
STA lastc else save it as last character
BRA trans05 go for more
print LEAX line,U point to character
LDY #120 get its length
LDA #1 use Standard Output
OS9 I$WRITLN print the char
BCC translit no error, go for more
transerr CMPB #E$EOF is error an End Of File?
BNE error no, then error exists
CLRB else clear error channel
error OS9 F$EXIT terminate the process

```

\*\*\*\*\*

\*

\* CONVERT TO A FOUR CHAR. SET

\*

makeset PSHS A,X,Y save these registers

CLR ,Y make the set a NULL set

CLR 1,Y

CLR 2,Y

CLR 3,Y

TST ,X do we use the NULL set?

BEQ mkst20 yes, then go

LDB ,X+ get the length

LDA ,X get first character

STA ,Y save it in set

CMPB #1 is length one?

BNE mkst05 no, then go

LDA ,X get first char

STA 1,Y save as upper limit

BRA mkst20 and go

mkst05 CMPB #3 is length three?

BNE mkst10 no, then go

LDA 2,X get last char

STA 1,Y save as upper limit

BRA mkst20 and go

mkst10 CMPB #2 is length two?

BNE mkst15 no, then go

LDA ,X get first char

STA 1,Y save as upper limit one

LDA 1,X get next char

STA 2,Y save as lower limit two

STA 3,Y and as upper limit two

## Educational Programs

### ? Questions ??

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```

LDA 2,X get last char
STA 1,Y save as upper limit
BRA mkst20 and go
mkst10 CMPB #2 is length two?
BNE mkst15 no, then go
LDA ,X get first char
STA 1,Y save as upper limit one
LDA 1,X get next char
STA 2,Y save as lower limit two
STA 3,Y and as upper limit two
BRA mkst20 and go
mkst15 CMPB #6 is length six?
BNE err no, then parameter error
LDA 2,X get third char
STA 1,Y save as upper limit one
LDA 3,X get fourth char
STA 2,Y save as lower limit two
LDA 5,X get last char
STA 3,Y save as upper limit two
mkst20 CLRB no error
return PULS Y,X,A,PC get old registers
err INCB error is true
BRA return and return

usemess FCC /Usage: tr [-s] from [to]/
FCB $0D

EMOD end of module
trend EQU *
END

```

## CORRECTIONS

**"The Computerized Shopping List" (April 1986, Page 216):** Dennis Weide has written to give us a correction and a hint to his *Shoptist* program. The hint: The last entry in Table 1 on Page 217 explains that an OD Error will occur if STOP is omitted from the data section of the program. This is Line 2010 in the listing, but the line number will vary depending on how many items you enter. Also, it is important to keep in mind that the program takes a few minutes to compile the data, so don't get excited if there isn't an immediate response.

The correction: In some instances a BS might occur in Line 1300 if the program isn't used properly. To alleviate this situation, delete Line 421. The program will work as it should.

**"A Peace Treaty for Computer Hackers and Couch Potatoes" (March 1986, Page 49):** Bill Bernico has written to tell us there is an error in his program *TV Shows*. If you pick the Network News option, the word "magazine"

appears. This is because the variable "Z\$" was not defined. To correct the problem, add the following line to the program:

```
375 Z$="BR3BU4R2DG2DR2"
```

**"The CoCo Zone" (April 1986, Page 26):** There are no reported problems with the actual program *CoCo Zone*. There have been, however, numerous calls from readers who are having trouble creating a working copy of the game. Running the *CoCo Draw* program draws and saves the graphics screens, *Zone 0* through *Zone 9* to the tape or disk for you. The final, working game tape or disk **must** have these files in the following order: *Boot*, *Zone 0*, *Zone 1*, ..., *Zone 9* and *CoCo Zone*. Then, CLOAD and RUN *Boot*, answer all prompts and you'll soon be ready to play the Adventure. Notice that *CoCo Draw* has nothing to do with the actual play of the game.

For quicker service, Corrections will be posted on Delphi as soon as they are available in the Info on Rainbow topic area of the database. Just type DATA at the CoCo SIG prompt and INFO at the Topic? prompt.



Recommended Reading for Your CoCo from . . .



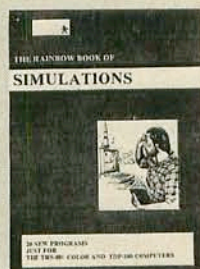
# The Rainbow Bookshelf



## The Complete Rainbow Guide To OS-9

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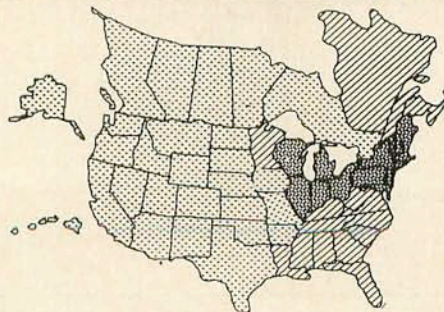
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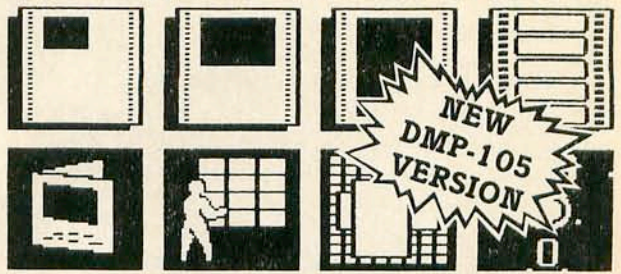
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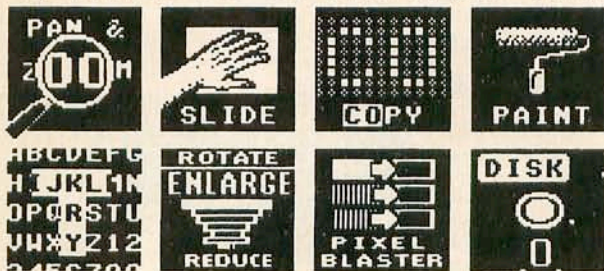


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Add text in 16 different sizes, also supports user definable foreground & background colors. Design & Edit characters for use in the typesetter.

### PIXEL BLASTER

Allows the user to easily substitute or remove colors. Widen lines, swap BLUE & RED without effecting BLACK & WHITE, etc.

### GRAPHICOM PART II DOES NOT REQUIRE GRAPHICOM TO RUN!

Graphicom Part II requires a 64K extended disk basic system, and supports 1 to 4 disk drives, keyboard or joystick (analog or switch type) input. It will load and save both Standard BIN files and Graphicom screens. All functions support color or Hi-Res operation, as well as the 4 screen display modes.

## PICTURE DISK SETS

Available from COMPUTIZE

- 4C - Artifact color palette
- 5C - Large character sets (from Derringer Software)

6C - Same as 5C but set up as stamp set

**Picture Disk Set 1 . . . . . \$19.95**

- 7 - Miscellaneous Art Set #1
- 8 - Miscellaneous Art Set #2
- 9 - Miscellaneous Ads and Examples

**Picture Disk Set 2 . . . . . \$19.95**

- 10 - Miscellaneous Fonts
- 11C - Artifact color palette type fonts

**Picture Disk Set 3 . . . . . \$14.95**

- 12C - Art demo from WHITESMITH
- 13C - GRAPHICOM PART II function demo

**Picture Disk Set 4 . . . . . \$14.95**

## GC II FONT DISKS

Each disk contains 10 or more fonts. (4 versions of each font, one for each display mode).

- 14C - GCII Fonts Disk #1
- 15C - GCII Fonts Disk #2
- 16C - GCII Fonts Disk #3

**GRAPHICOM PART II Font Disks . . . \$19.95**

## TRIPLE TRANSFER

UTILITY ©

Transfer contents of disk to tape • Transfer contents of tape to disk • Automatically relocates cassette programs that conflict with the disk operating system • Displays machine language program addresses • Copies ASCII, Basic, & Machine Language Programs • All contained in 1 menu driven program!

**REQUIRES 32K CC EXT.**

Cassette \$19.95 . . . Cat. No. 105CT

Disk \$24.95 . . . . Cat. No. 105CD

## SUPER BACK-UP UTILITY ©

WITH S.B.U. FROM COMPUTIZE - YOU'LL NEVER NEED ANOTHER BACK-UP UTILITY FOR YOUR COCO!! SUPER BACK-UP UTILITY WILL PERFORM ALL OF THE FOLLOWING FUNCTIONS:

1. TAPE TO TAPE (Regardless of most protection schemes!)
2. TAPE TO DISK (Move Cassette programs to Disk!)
3. AUTO RELOCATE (For those Cassette programs that conflict with Disk operating systems.)
4. DISK TO TAPE (Place Disk programs onto Cassette)
5. DISK TO DISK (Our powerful Split-N-Image Program, Copies regardless of most protection schemes!)

- MENU DRIVEN
  - REQUIRES 32K EXTENDED COCO
  - REQUIRES 1 OR 2 DRIVES
  - ALL MACHINE LANGUAGE!!!
- COMPARE WITH OTHER INDIVIDUAL PROGRAMS COSTING IN EXCESS OF \$100.00

**DISK \$49.95 . . . . Cat. No. 107CD**

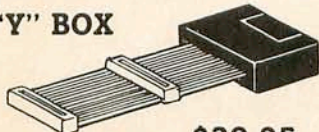
## SPLIT-N-IMAGE ©

M/L Disk Back-Up Utility  
There is no need to suffer the heartbreak of crashed disks any longer. Split-N-Image will create a mirror image of your valuable disk programs which do not respond to normal back-up functions. Will also initialize and back-up in one pass. Data processing experts always insist on having a back-up - it's good practice.

**REQUIRES 32K CC**

**DISK \$34.95 . . . . Cat. No. 101CD**

## "Y" BOX



**\$29.95**

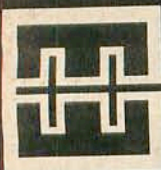
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Add \$3.00  
shipping

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add 6%  
sales tax

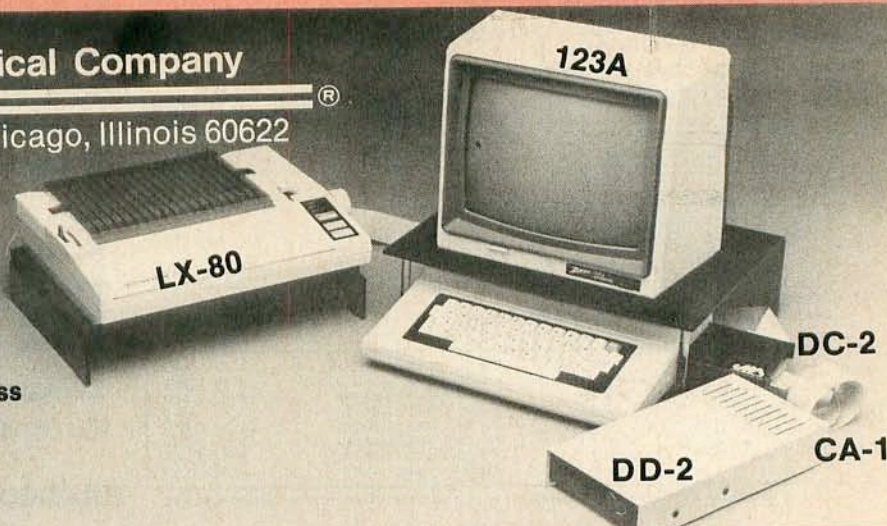




## Howard Medical Company

1690 N. Elston Chicago, Illinois 60622  
(312) 278-1440

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School P.O.'s



### New Dual Mode EPSON

The new Epson LX-80 offers printing flexibility in two modes: one mode allows you to print in a quick (100 cps) dot-matrix style for programming and graphics, and the Near Letter Quality mode (16 cps) produces precise (240 dots per inch), beautiful type for correspondence, reports, and similar purposes. The LX-80 offers 160 different type-style combinations, including Pica, Elite, Enlarged, Emphasized, Condensed, Subscripts and Superscripts, and type-styles can be selected quickly from the top control panel or from program control. Comes standard in friction feed; tractor option is also available.

LX-P package includes an LX-80, a serial interface, a Color Computer to Epson cable, and Printer Tutorial that teaches you how to program the different type styles (\$29.95 value).

**LX-P: LX-80 package \$317** (\$7 shpg)

**ET-1 tractor option for LX-80. \$29.50.**

**SF-1 Single-sheet feeder for the LX-80. \$145** (\$7 shpg)

Epson	RX-80 FT	repack	\$207.
Epson	LX-80 New		\$249.
Botek	Serial to parallel converter		\$68.45
Howard	CoCo to Epson cable		\$25.

DM-1 Disk mailer holds from one to five diskettes	\$20.
200 lb. cardboard construction	
25 mailers/box	

### MONITORS

**123 Zenith 12" Green Screen**, 640 dots x 200 dots resolution, 15 MHz band width. **\$114** (\$7 shpg)

**123A Zenith 12" Green Screen Special, \$67.50** (\$7 shpg) 80 Column non glare

**122 Zenith 12" Amber Screen**, 640 dots x 200 dots resolution, 15 MHz band width. **\$117** (7 shpg)

**141 Roland 13" Color Monitor** with speaker, 270 dots x 200 dots resolution, 4MHz band width **\$247** (\$12 shpg)

All monitors require video controller.  
Reverse video free with monitor order.

### MEMORY

64K Upgrades—1 Year Warranty

**64-E1 for E Boards** with complete instructions. Remove old chips and replace with preassembled package—no soldering or trace cuts. **\$28.45** (\$2 shpg)

**64-F1 for F Boards.** No soldering needed. Capacitor leads must be cut. **\$24.45** (\$2 shpg)

**64-2 for COCO 2.** Kit requires one solder point, no trace cuts. **\$24.45** (\$2 shpg)

### CONTROLLERS

**New Controller from J&M:** Has switch that allows either JDOS or RS DOS to be the disk operating system; eliminates software compatibility problems, while preserving the advantages of J&M's gold contacts and data separator. Also added to the DC-2 is a parallel port, which means a serial interface is no longer needed to make a parallel printer (like the Epson) work.

**DC-2 Disk Controller with JDOS \$128** (\$2 shpg)

**RS-1: RS DOS ROM Chip. \$20.00** (\$2 shpg)

**DC-1 Disk Controller** reads and writes to 35 and 40 track single and double-sided drives for all models of the Color Computer w/ JDOS. **\$128** (\$2 shpg)

**VC-1 Video Interface** mounts inside Color Computer by piggy-backing IC on top of interface—no soldering, no trace cuts. All models give composite video & sound. **\$24.45** (\$2 shpg)

**VC-2 for COCO 2—mono only. \$26.45** (\$2 shpg)

**VC-3 for COCO 2—both color or monochrome \$39.45** (\$2 shpg)

**VC-4 for new Color Computer** (no sockets, chips are soldered to mother board). Attaches with spring-loaded clips. Color or mono. **\$39.45** (\$2 shpg)

### EPSON AND J&M

The EJ-P Package

The Epson LX-80 Printer teamed with our new J&M DC-2 Controller gives you top printing capabilities plus built-in switch gives JDOS or Radio Shack DOS so all software can run on your Color Computer. Package includes: Epson LX-80 Printer with ET-1 tractor; DC-2 controller; parallel Color Computers to J&M cable; Epson Printer Tutorial (\$29.95 value).

**Complete EJ-P package \$425.00** (\$7 shpg)

**DD-2** Double sided 360K disk with 1/2 height case & heavy duty power supply **\$188.**  
**CA-1** Disk drive cable **\$24.50**  
**CA-2** Two drive cable **\$29.50**  
**DE-1** Disk enclosure 1/2 height with power supply **\$58.**

### HOWARD QUALITY STANDS



**New TS-1X Monitor Stand:** Designer-beautiful stand with clear corner posts, easy side access to ROM port, reset and on/off buttons. **\$39.50** (\$3 shpg)

**TS-1:** Standard 13" monitor stand for the original Color Computer. Specify black, ivory or clear. 15" x 11" x 4". **\$29.50** (\$3 shpg)

**TS-2:** Same as above for the COCO 2. **\$29.50** (\$3 shpg)

**PS-1X Printer Stand** features new noise-suppressing foam top and cork base. 15" x 11" x 2 1/2". **\$24.95** (\$3 shpg)

### GUARANTEE

Howard Medical's 30-day guarantee is meant to eliminate the uncertainty of dealing with a company through the mail. Once you receive our hardware, try it out; test it for compatibility. If you're not happy with it for any reason, return it in 30 days and we'll give you your money back, (less shipping).

Hours: 8:00-4:00 Mon.-Fri.  
10:00-3:00 Sat.

Software system requirements: CoCo with 1 disk, 32K RAM, 80-column printer  
Add \$2 for shipping.

### ORDERS (800) 443- 1444

**PAYROL/BAS**  
39.95

**LEDGER**  
free with  
**PAYROL/BAS**

**STATE TAX**  
39.95

941

29.95

**CHECKS**

**VIP LIBRARY**  
\$125

SAP-II

19.95

BPA-1

19.95

### SOFTWARE CORNER

Automatically calculates FED & FICA and 3 additional user defined deductions.  
**TABLES ARE ALREADY ENTERED.**  
Prints checkbook with up to 30 user definable ledger numbers a \$39/VALUE

**WITH PAYROL/BAS YOU WILL ALSO WANT**

Automatically calculates state withholding including graduated taxes. **TABLES ALREADY ENTERED**  
Prints totals by quarter per employee  
Ideal for Federal 941 and state unemployment  
500 pin-feed checks specify blue green or brown \$57.25  
Softlaw's integrated package includes  
VIP Write, terminal, Database, Speller and CALC  
Stock analysis program organizes your portfolio and give specific sell & stop-loss points  
Chart your blood pressure from daily readings taken in the comfort of your home.



# DISTO

## SUPER CONTROLLER



ONLY \$99.95 US.



### FEATURES:

- Gold contacts on all connectors.
- Shielded metal box for low RF noise.
- 4 28-pin sockets for software expandability.
- Uses 2764 or 27128 EPROMs.
- EPROMs are software selectable.
- Internal Mini-Expansion Bus interface for:
  - 80 Columns
  - Real Time Clock and/or
  - Parallel Printer or
  - EPROM Programmer or
  - User Projects.
- Complete Radio Shack compatibility.
- New technology, no adjustments needed.
- Very Accurate 16mhz High Speed Master Clock.
- Needs +5 volts only, works on all COCOs or COCO IIs.

### EXPANSION ADD-ONS:

There are currently four add-ons available from DISTO for this controller:

#### PPRINT

The first is a Centronics Compatible Parallel Printer adapter. This adapter will allow you to connect a Centronics compatible printer directly to your controller, leaving the serial port of your computer free for your modem. Printer driver software included.

#### RTIME

The second is a Real Time Clock. This is a clock chip that will keep the proper time, date and year. A small battery keeps the time when the Computer is off, retrieve and set the time by using simple Basic POKES. Also available with the Real Time Clock is the optional Centronics Compatible Parallel Printer adapter. Software to set the clock and printer driver included.

#### MPROM

The third is a Mini EPROM Programmer. Yes, a low cost programmer that attaches to the disk controller. A must for the DISTO Super Controller. Program those often used utilities into EPROM and plug them directly into your controller. Will program 2764's or 27128's, a perfect mate for the DISTO Super Controller.

#### DISPLAY80

The fourth is a real knock-out. This is a three in one card. It's major function is to add an 80\*24 display to your computer. A feature packed package also includes RTIME and PPRINT. All in one neat package that fits inside the controller. OS9 software available. Call for more information.

#### CREDITS:

The DISTO Super Controller, add-ons and all its documentation are conceived and designed by Tony Distefano. The DISTO Super Controller and add-ons are manufactured and distributed by: C.R.C. COMPUTER INC. 10802 Lajeunesse, Montréal, Québec, Canada H3L 2E8 1-514-393-5293

\*DISTO and CRC Computers are registered trade marks. The DISTO Super Controller and add-ons are copyrighted by DISTO.



# HEAT UP YOUR COCO!

## New HARD DRIVES

Besides the obvious advantage of increased disk access speeds and a vast amount of storage, our COCO hard drives boast many innovative features. For instance, you may boot OS/9



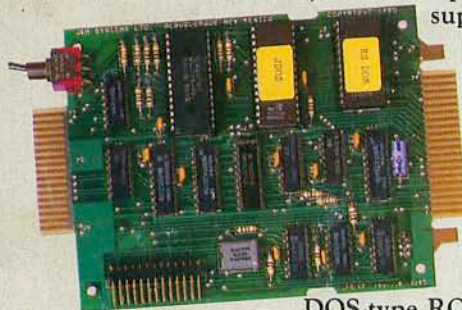
directly from JDOS - no intermediate boot floppy is required. Our software can run with virtually any winchester with a

ST412 type interface. Our drives have capacities of 5, 10, or 20 MBytes (formatted), and may be either partitioned into up to 7 logical units or left as one large logical unit. Our COCO hard drive systems are complete with case, power supply, cables, OS/9 drivers, and instructions. Prerequisite: OS/9, JFD-CP controller.

5 1/4" 5 MByte full size	\$495
5 1/4" 10 MByte 1/2 size	\$650
3 1/2" 20 MByte (shown above)	\$795

## JFD-CP DISK CONTROLLER

Our new JFD-CP, compatible with both the original COCO and the COCO 2, features a parallel port to support a



Centronics compatible printer or our hard drive, and an external ROM switch, which allows you to select JDOS or an optional RS

DOS-type ROM. It comes in

a case and includes JDOS 1.2 and manual. JDOS implements all RS DOS commands, plus many more, including auto line numbering, error trapping, baud rate selection, OS/9\* boot from floppy or hard drive, and Memory Minder\*\*, our disk drive analysis program (Precision Alignment Disk not included).

JFD-CP Disk Controller with JDOS \$139

## COCO-CLASSIC

Our old JFD-COCO controller remains a strong seller. Some people just like old "classics" best! So we have brought it back at the lowest price ever!

JFD-COCO Disk Controller with JDOS \$99

## New TERMS

One-year warranty on parts & labor; 30-day money back guarantee (except shipping) if not totally satisfied. Items must be returned in like new condition.

Free shipping via UPS in continental United States for payment by VISA, MasterCard, or cashiers check. COD requires 10% prepayment by bank card plus 3% shipping. Blue Label and foreign shipping extra.

## DRIVE SYSTEMS

Upgrade your Color Computer by adding our new JFD-CP disk controller, supercharged with JDOS 1.2



operating system, and a top quality drive with case and power supply. Comes complete with cable and JDOS manual.

Drive 0 System with one single side drive	\$279
Drive 0 System with one double side drive	\$349
Drive 0,1 System with two single side drives	\$389
Drive 0,1 System with two double side drives	\$489

## MEMORY MINDER\*\*



Memory Minder is a disk drive test program now included in JDOS. Used with a Precision Alignment Disk, Memory Minder allows you to check

your drives for speed, alignment, sensitivity, hysteresis, and more! You can actually align or adjust the drives while viewing the graphics on the screen. No special equipment needed!

PRECISION ALIGNMENT DISKS (From Dysan)

PAD-40X1: Tests single side disk drives	\$26
PAD-40X2: Tests double/single disk drives	\$33

Memory Minder is available on diskette for those who don't own a JFD-CP controller with JDOS. Includes Precision Alignment disk.

Memory Minder: single side package	\$59
Memory Minder: single/double side package	\$75

\*OS/9 is a registered trademark of Microware, Inc.

\*\*Memory Minder is a registered trademark of J&M Systems, Ltd.



J&M SYSTEMS, LTD.

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